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RADIO & TELEVISION NEWS

**JUNE
1955**

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FOR MAGNETIC TAPE?**

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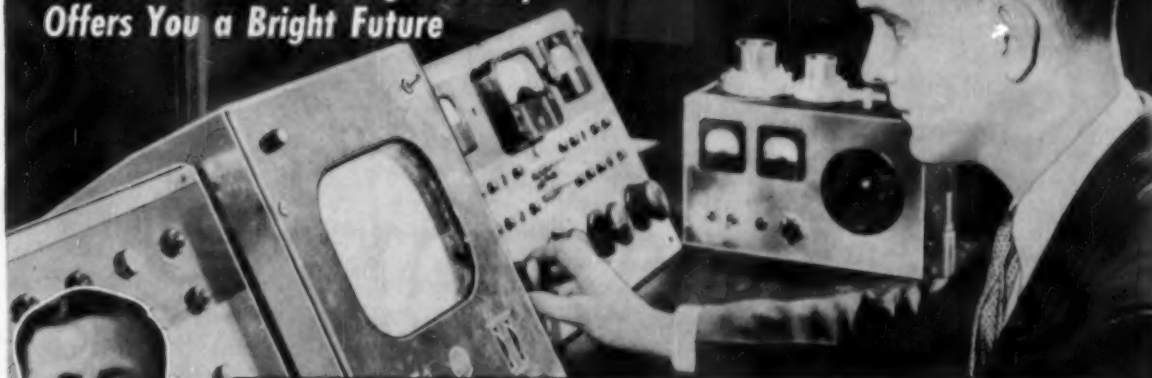


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Editor and Asst. Publisher
OLIVER READ, D.Sc., W1ET1

Managing Editor
WM. A. STOCKLIN, S. S.

Technical Editor
H. S. RENNE, M. S.

Service Editor
CHARLES TEPPER

Associate Editor
P. S. HOEFER

Assistant Editor
J. JUSTER

Television Consultant
WALTER H. BUCHSBAUM

Art Editor
FRANK SAYLES

Draftsman
A. A. GANE, W2TSP
J. A. GOLANEK

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JUNE, 1955

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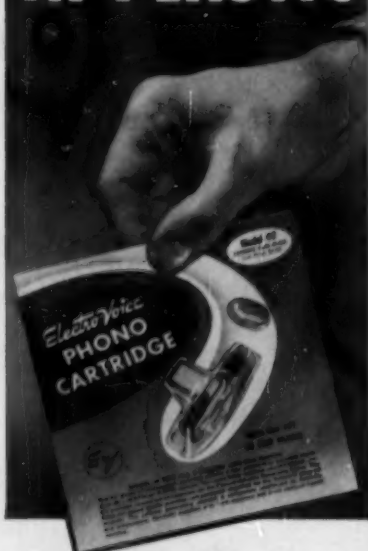
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For the RECORD.

• BY THE EDITOR

RADAR AND NAVIGATIONAL AIDS

NEW, and many times startling, applications for electronics are becoming daily headlines as this industry continues its more-than-rapid development of color television, communications, industrial electronics, and improved navigational aids.

Radar devices of all shapes and sizes are finding new applications almost every week. Mobile radar is a fast-growing nemesis to the speedster on the highways, and many small communities as well as the large cities are installing these compact equipments in great quantity. The familiar road-signs, "Policed By Radar," are now fact—not an oft-tried fake warning as many were in the past.

A month never passes without an opportunity to witness or to otherwise learn of some development in each of these specific fields. But it is unusual to find several major developments in one particular facet of electronics—announced simultaneously.

Just a few weeks ago, and within a period of a few hours, came the news of three new electronic devices designed to aid aircraft pilots, to eliminate and sharply reduce traffic delays, and to provide greater safety to passengers flying the airways.

A new and compact navigational aid called "Tacan," announced by I. T. & T., provides an accurate and continuous bearing of the pilot's position to within one degree. Distance, as well as direction of flight relative to a fixed ground station, is provided automatically and with extreme accuracy. The unit occupies approximately 1000 cubic inches which is several times smaller than that required to mount previous units. The range of the new system is classified and, as a result, the unit is identified as a short-range navigational aid. "Tacan" is said to provide a distance accuracy of one-fifth mile and an azimuth bearing accuracy to within one degree.

This new equipment was designed at the Federal Telecommunications Laboratories in Nutley, New Jersey, and, according to the announcement, accepted by the U. S. Air Force as well as the Naval Air Corps. The system meets the requirements for interservice standardization, it is said.

One of the most common flight hazards of aircraft has been overcome to a great extent as the result of a new airborne radar device which is quite similar to ones used by the military. This perfected instrument shows, on

its screen, a picture that reveals "fronts" and thunder storms many miles ahead. Dangerous turbulence, present in those areas, is bypassed by the pilot. The device supplies information on the distance and the location of the "weather" as well as the severity or intensity of a storm center.

Another application for this compact device is its ability to scan an area below and ahead of an aircraft to reveal mountain peaks, lakes, ships at sea, and cities. This performance is selected by the pilot by simply flicking a switch.

One of the major traffic problems of our ever-expanding commercial airlines has, or will soon be licked, by a new long-range radar device designed to reduce or to end traffic delays by cramming more airplanes into a limited area without danger to life, limb, or property. This new powerful radar, borrowed from the Air Force, is being tested in the busy New York area. It will provide data that can offset delays in landings and take-offs.

An airplane cruising at 300 mph (under present regulations) must have 30 clear miles in front and 30 clear miles to the rear at its altitude for safety. The new radar equipment (of much greater range) is able to show, on its screen, all airplanes in a large area. The flight controllers are now able to narrow the safe separation to from 3 to 5 miles at any given altitude. Heretofore, planes were picked up via short-range radar when they reached a point about 30 miles from the airport and received their landing instructions. The long-range radar screen now shows these aircraft clearly at a distance up to 100 miles.

This development is sure to be widely heralded by passengers of some 533,000 flights (1954) made by the airlines—many of them "stacked up" waiting to land, or others sitting in a parked plane on the ramp cursing heat in the aircraft as it sits under a broiling sun.

Our own experiences of delays last year would be estimated at a total of approximately 5 per-cent of total flight time. This figures about 5 hours of delays in 1954 alone. And our experience, shared by millions, totals to a lot of wasted time that can be saved by the new long-range radar.

These developments, we think, typify the ever-increasing value of electronics to our way of life in these United States. . . . O. R.

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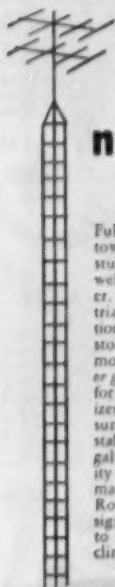
City.....Zone.....State.....

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Depend on the COMPLETE line of ROHN "SUPERIOR DESIGN" towers and accessories

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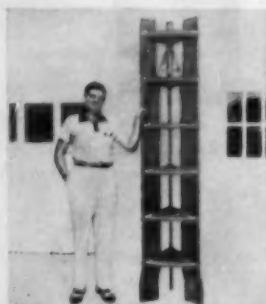
3 added towers to solve **ALL** your needs



no. 6 tower

"All-Purpose" tower.

Fulfills 75% of your general tower needs—is structurally as sturdy—yet costs less than the well-known Rohn No. 10 Tower. Ideal for home and industrial installations, communication requirements... eliminates stocking many different tower models. Self-supporting to 30 ft. or guyed to 120 ft. Easy to climb for fast, efficient servicing. Utilizes "Magic Triangle" which insures far greater strength and stability. Permanent hot-dipped galvanized coating. Dependability—a feature customers demand—is assured with the Rohn No. 6 Tower... designed to "stand up" for years to the rigors of weather and climatic conditions.



Package Tower

"Space Saver"—cuts storage space 900% or more!

Popular PT-48 has almost 50' of sturdy tower within a compact 8' x 20" package! "Magic Triangle" design is adapted to a pyramid shape using a wide 19" base with progressively decreasing size upward. Decreases your overhead... easy to transport and assemble—cuts shipping costs. Galvanized throughout. Available in heights of 24, 32, 40, 48, 50 and 64 feet!



no. 30 tower

Heights up to 200' or more when guyed

Self-supporting up to 60'

Sturdy communication or TV tower that "stands up" to all the stresses of weather and climatic conditions... will withstand heavy wind and ice loading. Heavy gauge tubular steel, electrically welded throughout. Weather resistant, non-corrosive double coating provides durable finish. All sections in 10' lengths. Only 2-4 manhours required for installing 50' tower!

also



ROHN Fold-over tower

For experimenters, TV service departments and retailers. Use this kit with regular Rohn tower sections. Simple and easy to use.



ROHN Telescoping Masts

Heavy-duty hot-dipped galvanized steel tubing and rigid joints give extraordinary strength. Quick installation... mast attached to base—antenna fixed, then mast hoisted quickly to desired height. Utilizes special clamp and guy ring arrangement. Flanged interior section; crimped exterior section gives mast stability that can't be beat. Complete with guy rings and necessary erection parts. In 20, 30, 40 and 50 ft. sizes. Bases and ground mounts available.



Bob Towers Feature

HOT-DIPPED GALVANIZING

Famous First for Rohn Towers

... to add more profits in your cash register.

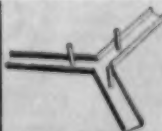
Yes, you can have these two famous towers in hot-dipped galvanized finish—the most durable and permanent coating of all! What a sales feature for you!

and a complete line of ROHN accessories—all galvanized



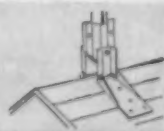
PEAK ROOF MOUNT

Heavy duty for quick, secure mounting of tower to top of peak roof. Flanges hinged, fastened to roof with 2 lag screws in each flange.



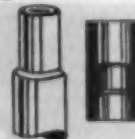
FLAT ROOF MOUNT

For all types flat surfaces. 3-1" solid steel projections permit first section of tower to be mounted directly on roof mount by inserting usual 5/8" bolts.



MAST BASES

Complete line of telescoping mast bases for every requirement, accommodating masts from 1"-2 1/4" diameter. Also available—driving-in mast bases.



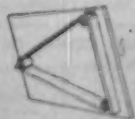
MAST 'N' TV TUBING

Heavy-duty, hot-dipped galvanized steel tubing. Machined to perfection. Extra sturdy joints slotted for full, perfect coupling.



PEAK and WALL MOUNTS

For mounting of mast or pole to roof or wall. Heavy-duty steel. Variable sizes. Models for most every need.



DRIVE-IN BASE

Set on top of ground... 3-4" drive rods driven through base into ground. First tower section secured to rods with single bolt in each leg. Instant erection.



SERVICE TABLE

Perfect answer for television servicing, display and storage. Truly one of the finest of its kind in economy price range.

ALSO AVAILABLE

Rotator posts for mounting rotator to tower; House Brackets; Guying Brackets; UHF Side Arm Mounts; Mounts for Additional Antennae on a Tower; Erection Fixtures; Guy Rings; Installation Accessories; and dozens of other items!

For complete catalog and prices, see your authorized Rohn Representative or Distributor; or write or wire direct.

Designed and Manufactured Exclusively by **ROHN Manufacturing Company**

116 Limestone, Bellevue Peoria, Illinois

RADIO & TELEVISION NEWS



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YOU CAN LEARN BY HOME STUDY, IF—

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- you want to broaden your knowledge and skill.
- you choose the school with the most complete training and service.

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Rush FREE BOOK, "Your Future in Radio-TV-Electronics," and FREE LESSON. No obligation, no salesman will call.

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Build Repeat Sales

Use Genuine

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TUBES**



Unexcelled research plus better materials and advanced production methods make Philco receiving tubes leaders in the field . . . assure top performance . . . build complete customer satisfaction and repeat sales for you!

Advanced Philco engineering and production methods insure mechanical and electrical superiority, uniform operation and trouble-free performance. Rigid quality control, exhaustive tests and extensive performance checks guarantee that every Philco tube you install is right and ready for sale.

Philco Receiving Tubes Improve the Performance of any Radio or TV Receiver

Built-in Philco quality is the reason why. Now you can eliminate costly call backs and build solid future business that means greater profit.

Millions of Philco set owners and millions of owners of other make receivers demand the full measure of performance that Philco tubes provide. Stock the Philco line of conveniently packaged tubes that assure you this ready-made market. Call your Philco Distributor today.



PHILCO CORPORATION
Accessory Division
Philadelphia 34, Pa.



Pipes of Progress

Hundreds of thousands of telephone conversations or hundreds of television programs may one day travel together from city to city through round waveguides—hollow pipes—pioneered at Bell Telephone Laboratories.

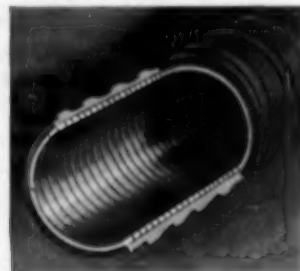
Round waveguides offer tremendous possibilities in the endless search for new ways to send many voices great distances, simultaneously, and at low cost. Today, Bell Laboratories developments such as radio relay, coaxial cable and multivoice wire circuits are ample for America's needs. But tomorrow's demands may well call for the even greater capacity of round waveguides.

Unlike wires or coaxial, these pipes have the unique property of *diminishing* power losses as frequencies rise. This means that higher frequencies can be used. As the frequency band widens, it makes room for many more voices and television programs. And the voices will be true, the pictures faithfully transmitted.

These studies illustrate once more how Bell Telephone Laboratories scientists look ahead. They make sure that America's telephone service will *always* meet America's needs, at the lowest possible cost.



Testing round waveguides at Bell Telephone Laboratories, Holmdel, New Jersey. Unlike coaxial cable, waveguides have no central conductor. Theoretically, voice-capacity is much greater than in coaxial cable.



New type of waveguide pipe formed of tightly wound insulated wire transmits better around corners than solid-wall pipes.



New type waveguide is bent on wooden forms for study of effect of curvature on transmission. The waveguide itself is here covered with a protective coating.



Bell Telephone Laboratories

Improving America's telephone service provides careers for creative men in scientific and technical fields.

June, 1955

13



G-C VINYLITE CEMENT
Great adhesion, many uses.
No. 58-2 NET \$0.39



G-C LACQUER THINNER
Thins all types.
No. 29-2 NET \$0.33



G-C LOW-LOSS TEST PRODS
Excellent for high voltage.
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G-C PLI-O-BOND CEMENT
Sticks "anything to anything".
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G-C INSULATED SPADE LUG
Red. Fits all banana plugs.
No. 7712 NET \$0.11



G-C INSULATED BANANA PLUG
Spring type, solderless.
No. 8994 NET \$0.21



G-C SCREW TYPE TERMINAL STRIPS
Has 6 contacts, others with 2, 10.
No. 1776 NET \$0.21



G-C GRAFOLINE
Lubricant for metallic contacts.
No. 120-2 NET \$0.39



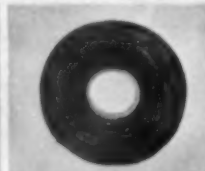
G-C SOLDERING PASTE
High-quality, non-corrosive.
No. 1207 NET \$0.27



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Rejuvenates dried-out cones.
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Dries in beautiful patterns.
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G-C RADIO FRICTION TAPE
Narrow 1/4" tape, 60-ft. roll.
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G-C DANDY LITE TESTER
Heavy duty; 60 V AC, 90-550 V AC-DC.
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GENERAL



CEMENT

Ask For These
RADIO-TV SERVICE AIDS

... at Your Jobber



G-C PHONO TURNTABLE STAND
Ideal for all turntable repairs.
No. 5205 NET \$4.95



G-C 'TUX' TOOL KIT
Carry all needed tools.
No. 8943 NET \$2.37



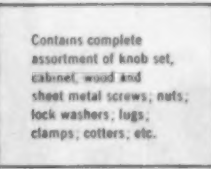
G-C 'HI-VOLT' SAFETY PROBE
Neon glow for all high volt tests.
No. 8836 NET \$1.65



G-C 300-OHM LINE TUBING
Protects, waterproofs in-line.
No. 625 NET \$0.66



G-C RADIO-TV HARDWARE LAB
Contains 20 assorted jars.
No. 6601 NET \$10.20



G-C UTILITY BOX
Spacious, handy, all-steel box.
No. 4003 NET \$1.47



G-C SPEEDX FUSE PULLERS
Handy, safe for 1/4"-1 1/2" dia. fuses.
No. 5525 NET \$0.42



G-C RADIO-TV SERVICE CEMENT
Famed high grade adhesive.
No. 30-2 NET \$0.39



G-C SPEEDX WIRE STRIPPER
Automatic, delayed action return.
No. 766 NET \$4.95



G-C SPRA-KLEEN
Power spray contact cleaner.
No. 8666 NET \$1.00



G-C KOLOID ACRYLIC SPRAY
Protects, insulates, prevents rust.
No. 8665 NET \$1.19



Ask your jobber for these



SPECIALS OF THE MONTH

FREE! Postcard brings your big G-C Catalog.



No. 8005-U NET \$1.11



No. 9015-X
Bag of 10
NET \$1.17



No. 8642-6P
Pack of 6
NET \$2.25



No. 9180 NET \$2.70



GENERAL CEMENT MFG. CO.

904 TAYLOR AVENUE • ROCKFORD, ILLINOIS



KAY-TOWNES

THE Original "BIG JACK"

Other
KAY-TOWNES
TV Antennas

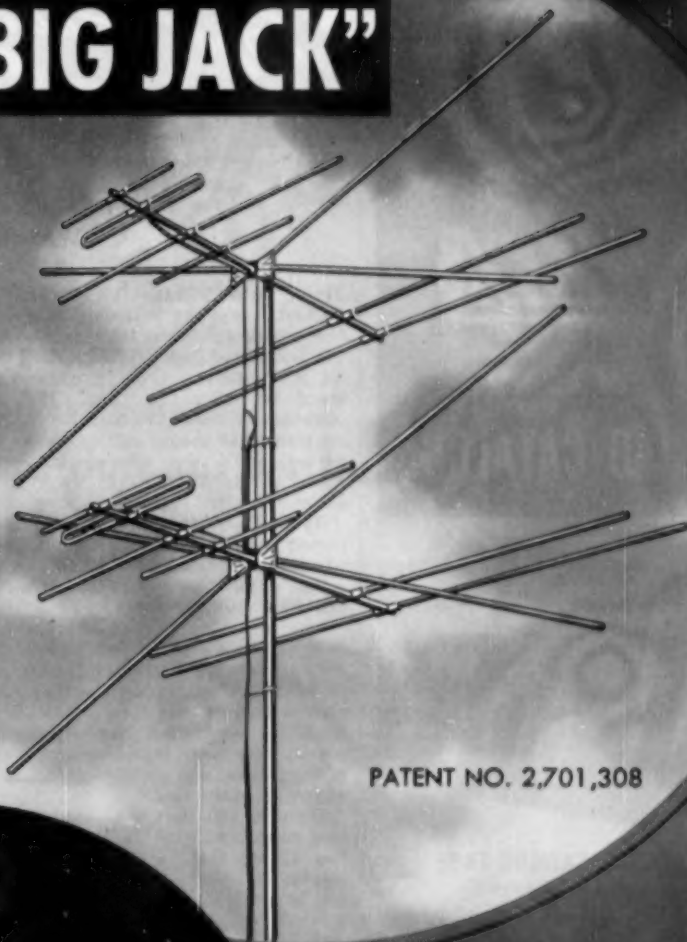
**SUPER
KATY**

**SUPER
GUARD**

**REAR
GUARD**

CONICALS

YAGIS



PATENT NO. 2,701,308

Win A 1956 CADILLAC!

KAY-TOWNES Announces
**THE GOLDEN HARVEST
CAMPAIGN**

AND A
Complete LINE OF ALL CHANNEL
CONICAL & YAGI ANTENNAS

Dealer - Distributor Contest

BEGINS JUNE 1—CLOSES NOV. 30

Prizes...

Write Today →

1956 Cadillac or \$5,000 Series B U.S. Bond
1956 Buick or \$3,500 in Series E U.S. Bonds
\$1,000 • \$750 • \$500 • \$400 • \$300 • \$200
• \$100 • \$50 • \$25 in Series B U.S. Bonds

CONTEST LIMITED TO DEALERS AND DISTRIBUTORS
IN CONTINENTAL U.S.A.

The patented Kay-Townes "BIG JACK" is the outstanding fringe area antenna, with a high gain on all VHF channels. Either preassembled or snap-out design for quick installation, its one-inch heavy aluminum boom withstands winds of gale force. The "Sure-Grip" cast aluminum mast clamp will neither spread, bend nor collapse. More and more dealers and distributors have discovered for themselves that the "BIG JACK" sells and stays sold.

Manufactured and Distributed in CANADA by
DELM METAL PRODUCTS, LTD., DELM, ONTARIO

CONTEST DEPARTMENT
KAY-TOWNES ANTENNA CO.
P. O. BOX 593 • ROME, GEORGIA

Gentlemen:

Please send me rules of the Golden Harvest Dealer-Distributor contest and additional information in regard to the complete line of Yagi and Conical television antennas.

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ADDRESS _____

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2

NEW TRIAD CATALOGS



GENERAL CATALOG TR-55
listing 84 new items



TV-GUIDE TV-155
giving latest recommendations
on correct television replacements

Contact your local
distributor for these 2 new
catalogs or write ...



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Spot Radio News

★ Presenting latest information on the Radio Industry.

By RADIO & TELEVISION NEWS'
WASHINGTON EDITOR

THAT AWESOME TERM 'FREEZE' flashed across the Washington scene a few weeks ago when the Commission's top trio, Broadcast Bureau Chief Curtis B. Plummer; Chief Engineer Edward W. Allen, Jr.; and Chief Accountant William J. Norfleet, issued an interoffice memo calling for a *chill* period, until the Commission could make up its mind as to what to do about the ultra-high.

Technically, the interim cooling-off period was described as applying only to those very-high applications in cities within 50 miles of an ultra-high community.

The memo noted that the Commission has viewed "... with some concern the status of the u.h.f. television service." The problems, they felt, stemmed from the "... inability of u.h.f. to meet v.h.f. competition primarily because of lesser coverage, lack of u.h.f. sets, and insufficient or inadequate programming."

Pointing out that the Commission is now concerned with the varied difficulties facing the higher-band stations, insofar as these problems obstruct official action to provide a nationwide service, the broadcast experts said that a study should now be undertaken to determine whether the current rules and policies are serving to promote the broad objectives of the FCC. Accordingly, while such a study is underway, it was explained, any "... additional v.h.f. authorizations in u.h.f. areas would only serve to aggravate the situation and would make more difficult any subsequent revision in rules and policies that might be necessary."

Therefore, continued the government spokesmen, the "... Commission has concluded that until further notice, requests for TV authorizations on channels 2 to 13 will be considered in accordance with ... the following procedure ... :

"Applications pending ... and filed for permits to construct new television stations ... will not be acted on ... where the v.h.f. transmitter or the principal community to be served is located within 50 miles of another community in which a u.h.f. station has been authorized. ..."

In addition, it was also said, no action would be taken where the problems of increased radiated power, increased antenna height, or antenna

movement in the direction of the u.h.f. community were involved.

The temporary shutdown edict was followed by a formal report to the Senate Interstate and Foreign Commerce Committee, in which the Commission bluntly told the Senators that the "... failure of u.h.f. to become integrated with the v.h.f. band is manifested by the fact that of the 318 u.h.f. stations authorized ... only one-third are presently in operation. Many authorized were never actually constructed. ... And the financial outlook for a number of the operating u.h.f. stations is by no means bright."

Agreeing with the conclusions reached in both the Plotkin and Jones reports that the "... only practicable course ... of action lies in doing what is possible to promote the present allocation plan utilizing both v.h.f. and u.h.f. channels," the Commission said that the "... addition of substantial new v.h.f. space or the movement of all television stations to u.h.f. would involve such tremendous dislocation of existing operations and have such a severe impact on millions of viewers, that such action should be considered as a possible alternative only if Congress itself were to determine that the long-run benefits to the public required adoption of such drastic remedies."

Reporting on the possibilities of selective de-intermixture, which might provide for a more balanced competition, while "... at the same time strengthening u.h.f. generally by increasing the number of 'islands' of permanent u.h.f. stability ..." the Commission said that it is studying such a plan. (After this statement was made, the Commission announced that it had issued a ruling asking for comments on demixing in some states. See detailed report on demix notice later in this column.)

The statement to Congress also contained some pertinent figures on the number of sets now in operation. Only 5,000,000 of the 35,000,000 TV receivers around, it was noted, are u.h.f.-equipped, and less than 20 per-cent of the chassis now being produced are all-channel models.

"It may well be," explained the Commissioners, "that this lack of u.h.f. receiving equipment, as well as the delay in developing high-power transmitting equipment, have been the most important single factors in the rela-

RADIO & TELEVISION NEWS

A must for after-dark TV servicing

G-E SERVI-SPOT


Electronic
TUBES

- FIND HOUSE NUMBERS!
- READ STREET SIGNS!
- CHECK OUTDOOR ANTENNAS!

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Plugs into the lighter socket on your dash.

Pre-focussed beam carries $\frac{1}{4}$ mile.

Compact, weighs only 6 oz., 12-ft. cord.

Manufactured by General Electric,
world leader in lamps.



Get your SERVI-SPOT from your G-E tube distributor! General Electric Company,
Tube Department, Schenectady 5, N. Y.

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Now G-E SERVICE-DESIGNED TUBES
are available in 14 popular types.
Ask your G-E tube distributor for them!

GENERAL  **ELECTRIC**

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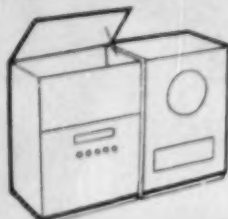


be your own audio engineer...

HI-FLI speaker-equipment cabinets

KITS by cabinart

ACOUSTICALLY ENGINEERED—ASSEMBLED WITH ONLY A SCREWDRIVER!



Model 80 has lift lid, removable panels. Bass reflex tuned for 12" or 15" speakers. Overall dimensions: 33 1/2" H, 23" W, 16" D. M80 tuner section, inside: 20" H, 21 1/4" W, 15 1/2" D. M8112, M8115 baffle volume: 6 cubic feet. 3/4" white pine

Model 80 equipment cabinet kit \$27.00
Model 8112 12" speaker cabinet kit 18.00
Model 8115 15" speaker cabinet kit 18.00

FEATURING THE KLIPSCH-DESIGNED

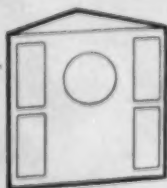
Rebel 4

DIRECT RADIATION OF HIGHS
BACK RADIATION OF LOWS

REBEL enclosure development entails a cavity and slot port, to form a resonant chamber, and a horn coupled to the slot. The slot is loaded by the horn; the proportioning of slot, cavity and horn provide bass response below 100 cycles which corresponds in efficiency to the front-of-cone direct radiator response above this critical 100-cycle point. There are two ways one might consider the function of this horn. One is a bass reflex with a horn acting as a resistive load on the port. System resonances are damped by useful radiation resistance while the horn does not cost anything. It is already formed by the room corner. Again, if a full horn were added below the 100-cycle point bass response would be boomy and unnatural. But, in the Rebel enclosures, the cavity-port combination acts as an acoustic low pass filter. And its design is such that low-end response will compare with response higher in the sound scale.

MODEL K-12—\$36.00
MODEL K-15—\$42.00

ready-to-finish birch



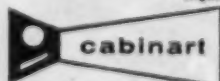
CORNER HORN

All kits precision-cut to size, baffles pre-cut for 12" or 15" speakers. Kits include Saran plastic acoustical cloth, glue, sandpaper, plastic wood, hardware, assembly instructions and finishing instructions. Write for complete catalogs and nearest Cabinart kit dealer.

Model 61, 12" speaker—\$19.95
Model 63, 15" speaker—\$23.95

slightly higher west and south

KIT FORMS BY



79 North 11th Street
Brooklyn, N. Y.

tive backwardness of u.h.f. development."

The Commission's chill proposal and request to engage in an over-all study of the high-low problem was assailed by the Interstate Committee's chairman, Senator Warren G. Magnuson. Such a freeze, he felt, would create quite a furore in Congress. He believed that most of the major difficulties could be overcome without any authorization stoppage. The failure of the Commission to provide immediate help would, in the Senator's opinion, actually irritate the situation and serve to "... soak the American householder."

A SPECTACULAR NEW DEVELOPMENT, providing for the remote control by radar and radio, of jet fighter aircraft on special drone missions, pilotless intercept, or nuclear tests, has been disclosed by the Air Research and Development Command.

The system provides automatic take-off and landings, with exact split-second control at all times, by radio and radar, during climb and dives, cruise, orbiting, or other aerial maneuvers. The ultra-highs are used for radio guidance and command subsystems; they supply tighter precision signals to the drone-fighter craft from jet pilots at beeper ground stations or in an accompanying jet director aircraft. And, if all control signals should be cut off while the drone is airborne, due to ground power failure or bomb damage, electronics also comes to the rescue.

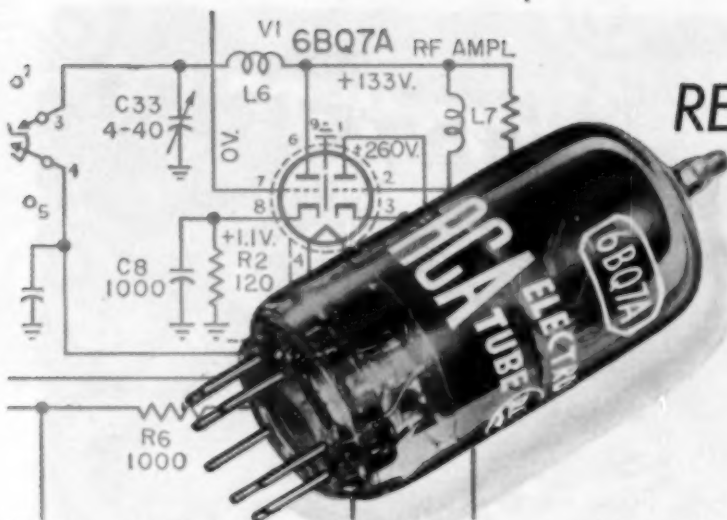
To illustrate, if the plane is below a preselected altitude when carrier signals are shut off, in five seconds, an electronic brain takes over the plane controls, and begins a full-power climb of exactly 7 degrees, retracts dive flaps if these were extended, and at 200 miles per hour changes to a climbing turn to the left, until proper altitude is reached. Then it engages altitude control and continues a left-turn orbit at 265 miles per hour at this constant level and position until a signal is restored to guide the aircraft back for normal landing procedures.

When the plane is above a selected altitude or might be in a critical take-off climb when a signal shut-off occurs, the safety control takes over and required measures are effected to produce a station-keeping orbit at proper altitude.

THE FIRST STEP in providing worldwide navigational information to military and commercial aircraft is now underway at Camden, N. Y. Here, using a new long-range system called "Navarho", developed by the Air Research and Development Command Headquarters Rome Air Development Center, three 15-kilowatt transmitters will beam information, via three 625-foot towers, in all directions over a distance of 2500 to 3000 miles.

According to Major General Stuart P. Wright, Commander of the Center, (Continued on page 108)

RADIO & TELEVISION NEWS



RESTORE
THE "HOP" IN
TV TUNERS...

Use RCA Tubes with Built-In Quality!



Known for their stability and background "quietness," RCA Tubes help boost the sensitivity of your tuner and reduce tuner noise.

Take the RCA-6BQ7A. Here is a tube having high transconductance, low input capacitance, low plate-to-cathode capacitance, and remarkable uniformity of characteristics—made possible by exacting control procedures during manufacture. Benefits: Greater stability, less receiver noise, higher gain—all the way to channel 13.

Boost the performance of that TV tuner—with RCA Tubes. Next time . . . and every time . . . tell your favorite distributor's counterperson or salesman you want genuine RCA Receiving Tubes *only*—type for type. You'll see the difference in better performance, fewer call-backs, and happier customers!



**RADIO CORPORATION
of AMERICA**

ELECTRON TUBES HARRISON, N.J.

Your First Choice for TV circuits . . . dependable RCA Tubes.

June, 1955

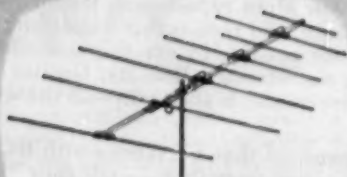
AGAIN *telrex* OFFERS
MORE BECAUSE...
**THERE IS A MATERIAL
DIFFERENCE!**

**NEW "THUNDER BIRD" "BEAMED POWER"
ARRAYS FOR ALL-CHANNEL TV**

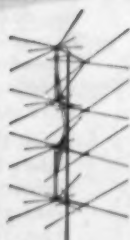
"THUNDER BIRD" Antennas are loop phased, multi-element, "Beamed Power" Arrays for fringe and "sub-fringe" area TV reception. Element functions are duplexed by means of variable impedance phasing loops to produce effective high gain Yagis for Hi and Lo channel VHF Bands in an all-in-line array which actually produces superior gain and directivity — element for element — than equivalent separate units.

**THUNDERBIRD
MODEL T120**

**PATENT
PENDING ***



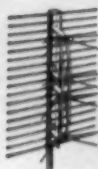
MODEL T110 THUNDERBIRD



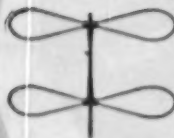
**"8X-TV"—the
Finest Fringe
Area All-Channel
Array ever
Produced**



**"DUO-BAND"
offers Sensational In-line
Directivity and
Gain on VHF
and UHF**



**"MODEL 84"
covers Full
UHF Range at
Highest Signal-
to-Noise Ratio
and Maximum
F/B Ratio**



**"CLOVER-V-BEAM"
a Real Per-
former, Low
Cost and Incon-
spicuous, Con-
figuration Ideal
for Second Set
Installations**

**Producers of famous "BEAMED
POWER" Communication Rotaries.
Call or write for new catalogs
on TV Antennas, Commercial
Arrays or Amateur Rotaries.**

• Top quality materials and construction plus superior performance is the TEL-REX watchword. Superb engineering combined with exhaustive laboratory and field testing assures reception quality that surpasses factory ratings. Over 100 different models are available to solve every installation problem, whether it be low cost or extra performance. Best quality materials assure peak performance rain or shine.

See the new TELREX Exhibit at the Parts Show! Visit us at Booth 223, Electronic Parts Show Conrad Hilton Hotel, Chicago, May 16th to 19th inclusive.

telrex INC.
"CONICAL-V-BEAMS"

AMERICA'S
OUTSTANDING
TELEVISION
BEAM

**ASSBURY PARK 7
NEW JERSEY, U.S.A.
Tel. PHospect 5-7252**

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LTD., Delhi, Ontario

*"Conical-V-Beams" are produced under U. S. Patent No. 23,346, Canadian Patent No. 500,436 and British Patent No. 691,485 — other patents pending. Sold only through authorized distributors.

No dead spots No hot spots

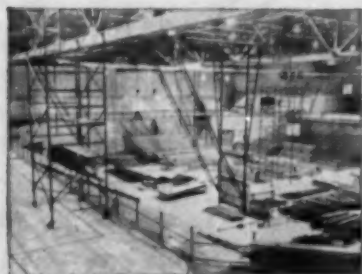


Partial view of CDP installation at modern Lincoln Fields Race Track, located just south of Chicago at Crete, Illinois

OFF AXIS and ON AXIS
Coverage is Clear, Penetrating, Uniform

CDP®

**COMPOUND
DIFFRACTION
PROJECTOR***



Electro-Voice CDP Public Address Loud-speaker System was chosen for the 8,248 seat North Side Gym, Elkhart, Indiana, one of the nation's largest high school gyms. Cluster of stacked CDP's can be seen in photo taken during construction.

Model 848 CDP. 25 watts. 16 ohms. Conservatively rated ± 3 db from 175 to 10,000 cps. Crossover at 1000 cps. Variable polar patterns. Size: 10 $\frac{1}{4}$ in. wide, 20 $\frac{1}{4}$ in. high, 20 in. deep over-all. List Price: \$49.50 Net Price: \$41.75

Outdoors or indoors, everyone can comfortably hear everything when you use the CDP. Listeners off the axis, where the majority of audiences are, do not have to strain to hear, while those on the axis are not assaulted by blasts of sound. The CDP provides smooth peak-free wide-range response, with 120° sound distribution at all frequencies up to 10,000 cps. Unit energy is far more efficient—there's no wasted power. You can do a better job with fewer units at less cost. CDP utilizes two coaxially mounted diffraction horns, working from both sides of a single diaphragm, plus optical slit diffraction for smooth sound dispersion. CDP delivers 2 $\frac{1}{2}$ octaves more musical range than comparative units. Molded of glass fibers, CDP is weather-proof, blast-proof, splash-proof. Compare the CDP with any other unit in the environment in which it actually will be used—in the field or in an auditorium. Prove to yourself why it is so superior, why it is the best value ever!

*Pat. 2,719,801 and Pat. Pend.



Send for CDP Public Address Handbook Bulletin No. 195. Gives complete and helpful information.

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Electro-Voice®

ELECTRO-VOICE, INC. • BUCHANAN, MICHIGAN
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WHAT'S YOUR SERVICE PROBLEM?

FM Radios • Amplifiers and Tuners • Auto Radios • Record Changers

PHOTOFACT HELPS YOU SOLVE IT FASTER, EASIER, BETTER, MORE PROFITABLY!

THE WORLD'S FINEST SERVICE DATA

PHOTOFACT Service Data is the only service information based upon first-hand examination of the actual production-run receivers and equipment. It is authentic, uniform data developed through actual study and analysis by service engineers in the Howard W. Sams Laboratories. PHOTOFACT is the only data prepared from the practical point of view of the Service Technician.

Thousands of Service Technicians use PHOTOFACT daily for time-saving, profit-boosting service operations. If you've never used PHOTOFACT, you've never realized your full earning power—you've never given such complete customer satisfaction. So get the proof for yourself. Try PHOTOFACT—use it on any job. Your Parts Distributor has the Folder Sets you need for any of the 17,000 TV and radio receivers, changers, recorders, etc., covered in PHOTOFACT. Once you use this great service, we know you'll want the complete PHOTOFACT Library.



THESE GREAT FEATURES ARE EXCLUSIVE IN PHOTOFACT—THEY HELP YOU EARN MORE DAILY, HELP INSURE CUSTOMER SATISFACTION

FULL SCHEMATIC COVERAGE

1. Famous "Standard Notation" uniform symbols are used in every schematic.
2. The same standard, uniform layout is used for each schematic.
3. Diagrams are clear, large, easy to read, easy to handle.
4. Wave forms are shown right on the TV schematics for quick analysis by 'scope.
5. Voltages appear on the schematics for speedy voltage analysis.
6. Transformer lead color-coding is indicated on the schematic.
7. Transformer winding resistances appear on the schematic.
8. Schematics are keyed to photos and parts lists.

FULL PHOTOGRAPHIC COVERAGE

9. Exclusive photo coverage of all chassis views is provided for each receiver.
10. All parts are numbered and keyed to the schematic and parts lists.
11. Photo coverage provides quicker parts identifications and location.

ALIGNMENT INSTRUCTIONS

12. Complete, detailed alignment data is standard and uniformly presented in all Folders.
13. Alignment frequencies are shown on radio photos adjacent to adjustment number—adjustments are keyed to schematic and photos.

TUBE PLACEMENT CHARTS

14. Top and bottom views are shown. Top view is positioned as chassis would be viewed from back of cabinet.
15. Blank pin or locating key on each tube is shown on placement chart.
16. Tube charts include fuse location for quick service reference.

TUBE FAILURE CHECK CHARTS

17. Shows common trouble symptoms and indicates tubes generally responsible for such troubles.
18. Series filament strings are schematically presented for quick reference.

COMPLETE PARTS LISTS

19. A complete and detailed parts list is given for each receiver.
20. Proper replacement parts are listed, together with installation notes where required.
21. All parts are keyed to the photos and schematics for quick reference.

FIELD SERVICE NOTES

22. Each Folder includes time-saving tips for servicing in the customer's home.
23. Valuable hints are given for quick access to pertinent adjustments.
24. Tips on safety glass removal and cleaning.

TROUBLE-SHOOTING AIDS

25. Includes advice for localizing commonly recurring troubles.
26. Gives useful description of any new or unusual circuits employed in the receiver.
27. Includes hints and advice for each specific chassis.

OUTSTANDING GENERAL FEATURES

28. Each and every PHOTOFACT Folder, regardless of receiver manufacturer, is presented in a standard, uniform layout.
29. PHOTOFACT is a current service—you don't have to wait a year or longer for the data you need. PHOTOFACT keeps right up with receiver production.
30. PHOTOFACT gives you complete coverage on TV, Radio, Amplifiers, Tuners, Phonos, Changers.
31. PHOTOFACT maintains an inquiry service bureau for the benefit of its customers.

ONLY \$25 DOWN

Puts a Photofact Service Data Library in Your Shop. Ask Your Photofact Distributor—He Has the Full Easy-Pay Details.

FREE

PHOTOFACT CUMULATIVE INDEX



Send for it! Your guide to virtually any model ever to come into your shop; helps you locate the proper PHOTOFACT Folder you need to solve any service problem on any model. Once you have the make and chassis number, it

takes just 60 seconds to find the applicable PHOTOFACT Folder. Send coupon now for your FREE copy of the valuable Cumulative Index to all PHOTOFACT Folders.

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City.....Zone...State.....

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KEEP YOUR PRESENT JOB AND TRAIN TO BE A TELEVISION TECHNICIAN

Step into a Higher Paying Position Without
Giving Up Your Present Income



L. C. Lane, B.S., M.A.
President, Radio-Television
Training Association, Executive
Director, Radio School
of Radio & Television

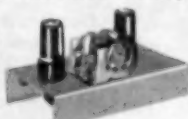
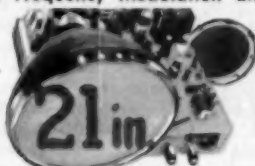
**I'll train you at HOME
in your SPARE TIME**

If you're now working as a Radio Technician, Maintenance Man, or Operator you can keep your job while studying one of my two NEW and UP-TO-THE-MINUTE Courses — FM and Television Technician Course — TV Cameraman and Studio Technician Course.

These Courses — especially prepared for home study—will prepare you for top-paying jobs in the ever-expanding radio-television-electronics industry.

EXPERT FM-TV TECHNICAL TRAINING

My FM-TV Technician Course lets you take full advantage of your previous experience — either civilian or Armed Forces. YOU CAN SAVE MONTHS OF TIME. My FM-TV Technician Course completes your training by providing a thorough background in Frequency Modulation and Television Theory and Practice.



C.W. Telephone Transmitter



Public Address System



Super-Hot
Radio Receiver



B.F. Signal
Generator



Combination Voltmeter-
Ammeter-Oscilloscope

You "Learn by Doing", working with parts and equipment I send you. Six large kits of FM and TV parts are given to you as part of the course. You build and keep a professional GIANT SCREEN TV RECEIVER complete with big picture tube (designed and engineered to take any size up to 21-inch).

Upon completion of your training you may — if you desire — take two weeks of shop training at my associate resident school in New York City AT NO EXTRA COST!

PRACTICAL TV CAMERAMAN & STUDIO COURSE

My TV Cameraman and Studio Course is designed to train TV Studio Technicians and TV Cameramen, urgently needed today by Television Broadcasting Stations throughout the nation. New TV Stations are now mushrooming throughout the country. Men who can work as Audio Technicians, TV Cameramen, Microphone Boom Operators, Monitor Operators, Turntable Operators, Control Room Technicians can write their own tickets.



I will train you for an exciting high pay job as the man behind the TV camera. Work with TV stars in TV studios or "on location" at remote pick-ups.

Available if you want it . . . one week of actual work with studio equipment and TV Cameras at my associate resident school in New York City.

This course is a MUST for those who wish to increase their technical knowledge of television operations.

TRAINING FOR BEGINNERS

My Radio-FM-Television Technician Course is especially prepared for men with no previous experience or training. I have trained hundreds of men for successful careers in radio-television-electronics. Many of them had only a grammar school education and no previous experience whatsoever in the field.

Two weeks of intensive shop practice at my associate resident school is also included with this Course.

Radio Television Training Association

52 EAST 19th STREET • NEW YORK 3, N. Y.

Licensed by the State of New York • Approved for Veteran Training
June, 1955

FREE FCC COACHING COURSE

Important for BETTER PAY JOBS requiring FCC license. You get this training AT HOME and AT NO EXTRA COST. Top TV jobs go to FCC-licensed technicians.

VETERANS!

My School fully approved to train veterans under new Korean G.I. Bill. Write discharge date on coupon.

EARN WHILE YOU LEARN

Almost from the very start you can earn extra money while learning, repairing Radio-TV sets for friends and neighbors. Many of my students earn up to \$25 a week . . . pay for their entire training from spare time earnings . . . start their own profitable service business.

YOU GET THESE FOUR FREE!

MAIL THIS COUPON TODAY!

no salesman will call!



Mr. Leonard C. Lane, President
RADIO-TELEVISION TRAINING ASSOCIATION
52 East 19th Street, New York 3, N. Y.

Dept. T-1

Dear Mr. Lane: Mail me your NEW FREE BOOK, FREE SAMPLE LESSON, and FREE card that will show me how I can make BIG MONEY IN TELEVISION. I understand I am under no obligation and no salesman will call.
(PLEASE PRINT PLAINLY)

Name _____ Age _____

Address _____

City _____ State _____

I AM INTERESTED IN:

☐ Radio-FM-TV Technician Course

☐ FM-TV Technician Course

☐ TV Cameraman & Studio Technician Course

VETERANS!

Write discharge date _____

SELF-POWERED

McIntosh



C-8-PM
with cabinet \$107.50

\$99.50
C-8-P
without cabinet

Professional AUDIO COMPENSATOR AND PRE-AMPLIFIER

Now self-powered, the McIntosh C-8P is easily connected to any system to provide the most advanced in high fidelity compensation control. Abundant flexibility is possible with five bass (turnover) and five treble (roll-off) switches, an aural compensator, a rumble filter, separate wide-range bass and treble controls, and a five-program-source selector for tuner, tape recorder, microphone, and two phonograph cartridges. The McIntosh assures greatest listening pleasure from any sound source.



Small separate power supply (not shown) brings maximum convenience of installation. Rear panel (shown above) features five inputs, three outputs, equalization switch for amplitude and magnetic cartridges, variable load resistor for magnetic cartridges.

Write for Details and FREE
Record Compensation Guide

McIntosh

LABORATORY, INC.

326 WATER STREET, BINGHAMTON, N. Y.
Export Division: 25 Warren St., New York 7, N. Y.
Cable: Simontec, N. Y.

Within the INDUSTRY

WALTER S. LEFEBRE, a familiar figure in the radio and television industry for more than 30 years, has retired as a member of the radio and television division of **Sylvania Electric Products Inc.**



Prior to his retirement, Mr. Lefebre was the division's market development manager. He joined the Sylvania organization in 1950 as a field sales manager of the division and subsequently became a district sales manager, servicing such territories as Pittsburgh, Cleveland, Philadelphia, Syracuse, and Buffalo.

He began his career in the industry in 1923 as a manufacturer of loudspeakers. In 1929 he joined the sales staff of **National Union Radio Corp.** and five years later joined **Philco**. He was also associated with **Westinghouse** as assistant sales manager for radio.

WESTINGHOUSE ELECTRIC CORPORATION has announced plans to construct a combined manufacturing plant, engineering, and office building for the production of military electronic equipment near Friendship Airport, Baltimore, Maryland. Plans call for full occupancy and operation by January of next year . . . Ground has been broken for the new West Coast plant of **FAIRCHILD CAMERA AND INSTRUMENT CORPORATION** which will be situated on a six-acre site on East Washington Boulevard adjacent to the Santa Ana Freeway in Los Angeles. The plant will provide expanded manufacturing facilities for the firm's potentiometer division . . . **HENRY P. SEGEL COMPANY, INC.**, Boston manufacturers' representative firm, will construct a modern, air-conditioned building at 384-386 Washington St., Brookline, Mass. The new location will provide a large parking area for customers in addition to offering extensive display space for a complete line of electronic equipment . . . A new plant, to be located at 5121 San Fernando Road, Los Angeles, will house all divisions of the **ELECTRONIC SPECIALTY COMPANY**, manufacturers of airborne electronic equipment . . . **PAGE ELECTRICAL INSTRUMENT CO., INC.**, the meter manufacturing division of **PRECISION APPARATUS**, is now occupying a new plant at 70-31 84th Street, Glendale 27, Long Island, N. Y. . . The transfer of all operations to a new plant at Lexington, Ohio has been announced by **STEVENS MANUFACTURING COMPANY, INC.** The new plant at 45 North Plymouth Street is a single-story structure of 31,000

square feet . . . **WARD TERRY AND COMPANY** of Denver has recently opened a new \$250,000 electronic parts division at 70 Rio Grande Boulevard. The firm handles **RCA** products in Denver . . . **HYCON MFG. COMPANY** has purchased a 67-acre industrial property in LaVerne, California, adjoining the Pomona Fair Grounds. The property will be used for a new plant . . . **SYLVANIA ELECTRIC PRODUCTS INC.** has selected a location in the town of Camillus, N. Y., near Syracuse, as the site of the company's new data processing center. A 50,000 square foot building will be erected shortly . . . Plans to acquire two large manufacturing plants, one in Cleveland and one in Detroit, were announced by **THOMPSON PRODUCTS, INC.**, producer of automotive, aircraft, and electronic parts. The chassis plant in Detroit will be built this year while the Cleveland property is one acquired from **WHITE MOTOR CO.** . . . **RADIO CORPORATION OF AMERICA** has dedicated its new Aviation Systems Engineering Laboratory in Waltham, Mass. Approximately 100 scientists, engineers, and laboratory personnel will be employed at the new facility by the end of the year . . . **TENSOLITE INSULATED WIRE CO. INC.** of Tarrytown, N. Y. has recently completed new plant additions which have doubled the firm's production capacity at 196 Main Street.

MILTON S. PAGE has been named to the post of sales engineer for the Technical Sales Department of **Allen B. Du Mont Laboratories, Inc.**



He has been assigned to the company's Tube Research Laboratory where he will participate in the expanding sales activity of the company's multiplier phototubes and special cathode-ray tubes to government and private industry as well as sales of the company's regular line of cathode-ray oscillographs and other electronic instruments.

Mr. Page joined the company in 1951 and has served in several technical capacities.

ERIE RESISTOR CORPORATION has announced the formation of a new division for the engineering and production of special electrical, electronic, and mechanical assemblies. The new division is located in Erie, Pa. . . The Instrument Division of **ALLEN B. DU MONT LABORATORIES, INC.** has established a Systems Engineering group to assist industry by the application of

RADIO & TELEVISION NEWS



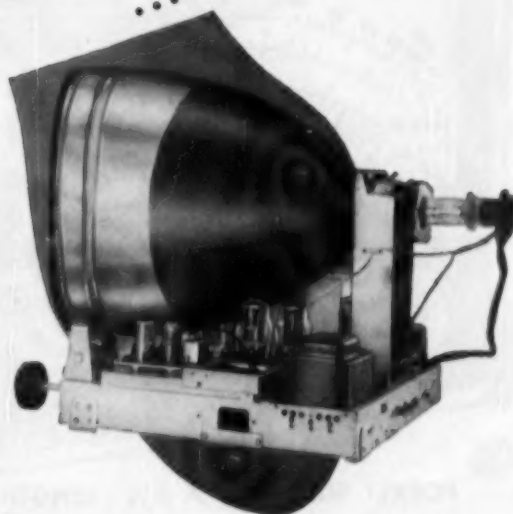
...from start



...and step by step



...to finish



Become a top-notch television service technician

**Now . . . RCA INSTITUTES offers modern TV KIT
with Comprehensive Television Servicing Course**

START to build with a TV Kit developed by one of America's foremost radio-tv schools—RCA Institutes. LEARN with simple step-by-step instruction how to build a modern, large-screen receiver. TEST each stage, as you build, and see how it works. Learn how "trouble-shooting" is applied. FINISH your Home Study Course ready and able to service all make and model sets!

Easy-to-follow instructions are planned and prepared for you through the efforts of RCA Institutes' instructors, engineers at RCA Laboratories, and training specialists of the RCA Service Company.

The RCA Institutes' TV Kit utilizes up-to-date circuits including:

- Synchro-Guide horizontal automatic frequency control circuit.
- Horizontal magnetic reaction scanning.
- Latest deflection circuits.
- FM sound discriminator.
- High-gain, low-noise cascade tuner.

Join the many thousands who have been successfully trained by RCA Institutes for a good job (or business of their own) in television servicing.

BASIC KNOWLEDGE OF RADIO NECESSARY
NO NEED FOR PREVIOUS TV TRAINING



RCA INSTITUTES, INC.

**A SERVICE OF RADIO CORPORATION OF AMERICA
350 WEST FOURTH STREET, NEW YORK 14, N.Y.**

FREE BOOKLET! MAIL COUPON NOW.

RCA INSTITUTES, INC., Home Study Dept. NK-6-55,
350 West Fourth Street, New York 14, N.Y.

With no obligation on my part, please send me a copy of your booklet on the TV Servicing Home Study Course and Kit. I understand no salesman will call.

Name: _____ (Please print)

Address: _____

City: _____ Zone: _____ State: _____

your KEY
TO EXCELLENCE
phaostron

"555" metal-cased MULTIMETER

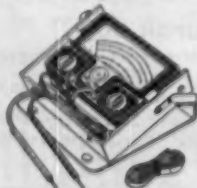


POCKET SIZE WITH A 4 1/4" LENGTH SCALE
an instrument of **PERMANENT ACCURACY**
in a case that **WON'T BREAK**

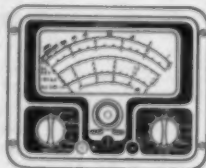
- ✓ AC CURRENT RANGES
- ✓ SEPARATE RANGE & FUNCTION SWITCHES
- ✓ SIMPLICITY . . . ONLY 2 JACKS
- ✓ EASY-TO-READ, LARGE 4 COLOR SCALES
- ✓ 43 UNDUPLICATED RANGES
- ✓ MAGNETIC SHIELDING
- ✓ 3% DC, 4% AC PERMANENT ACCURACY

Accessories Available

GENUINE LEATHER CARRYING CASE \$5.95



PANEL MOUNTING ADAPTER \$1.50



\$39.95 "555" MULTIMETER
complete with probes and batteries
at your **PARTS DISTRIBUTOR**

PHAOSTRON COMPANY 151 PASADENA AVE., SOUTH PASADENA, CALIF. U.S.A.

electronic techniques to automatic production and quality control methods. The activity will headquarter at the Clifton, N. J. plant of the company . . . A new automation division for design and engineering connected with the manufacture of electro-mechanical assemblies has been announced by the **RADIO CONDENSER COMPANY** of Camden 3, N. J. . . . **INLAND AUTOMATIC, INC.** has been set up at 1108 Jackson Street, Omaha 8, Nebraska to serve electronic and parts manufacturers who require automatic screw machine precision parts of difficult-to-machine materials. Dept. E-9 of the firm will handle all requests from manufacturers . . . **THE BRUBAKER MANUFACTURING COMPANY** has changed its name to **BRUBAKER ELECTRONICS, INC.** The firm has plants in Los Angeles and Culver City.

NATHAN CHIRELSTEIN, chairman of the board of **Allied Electric Products, Inc.** and its division, **Sheldon Electric Co.**, died recently after a short illness following a heart attack. He was 55 years old.



In 1923 he founded the **Sonatron Tube Co.** and six years later that firm was merged with three other companies to form the **National Union Radio Corp.** of which he became president. He resigned this post in the early 1930's and founded **Allied** in Newark, N. J. The firm later moved to Irvington and now has a branch factory in Los Angeles.

INTERNATIONAL RESISTANCE COMPANY has announced the acquisition of the **HYCOR COMPANIES** of California and Puerto Rico. The new subsidiaries will continue to operate independently . . . **TOPP INDUSTRIES, INC.** of Los Angeles has merged with **BONNER MACHINE WORKS, INC.** through an exchange of outstanding stock. The merged companies will retain the name of **TOPP . . . ELECTRONIC SPECIALTY CO.** of Los Angeles has acquired a controlling interest in **ELECTROMECH, INC.** of Burbank, California, which will be operated as a subsidiary of the parent firm . . . **JORDAN ELECTRONIC MFG. CO., INC.** of Pasadena, California, has been acquired by **PANELLIT, INC.** of Chicago and will be operated as a wholly-owned subsidiary. A new plant for the subsidiary is being built in Alhambra, California . . . Plans for the merger of **DAYSTROM, INCORPORATED** and **WESTON ELECTRICAL INSTRUMENT CORPORATION** have been announced . . . **ACME ELECTRONICS, INC.** has merged with the Pacific Coast Division of **AEROVOX CORPORATION** and will henceforth operate under the latter company's name. Both of the former operations will be carried on at the division's 50,000 square foot plant in Monrovia, California . . . **ASKANIA REGULATOR COMPANY** has acquired the good-will and physical assets of **HEINZ ENGINEERING COMPANY** of

(Continued on page 118)

RADIO & TELEVISION NEWS

SYLVANIA SILVER SCREEN 85

The picture tube with Selling Power!

That's right! Sylvania's "Silver Screen 85" puts powerful, profitable salesmanship behind your personal TV service. That's because "Silver Screen 85" is the picture tube TV America knows and asks for by name.

Every week Sylvania's "Beat the Clock" show builds greater consumer recognition and demand for the "Silver Screen 85." Every week dealers benefit at the payoff point.

Put the "Silver Screen 85's" selling power to

work for you. This booklet tells your customers the benefits of Sylvania's "Silver Screen 85." Leave a copy on every service call. Order a free supply now from your Sylvania Distributor.

SYLVANIA ELECTRIC PRODUCTS INC.
1740 Broadway, New York 19, N. Y.
In Canada: Sylvania Electric (Canada) Ltd.,
University Tower Building, Montreal
LIGHTING • RADIO • ELECTRONICS
TELEVISION • ATOMIC ENERGY



"Installing a 'Silver Screen 85' sure increases the value of a trade-in set and speeds turnover."



"Silver Screen 85" sales are up over all other brands."

TV service volume increased by 'Silver Screen 85' tie-in advertising."



SYLVANIA®
... fastest growing name in sight

LAFAYETTE'S SPECTACULAR MONEY SAVERS

A BUY OF A LIFETIME

PORTABLE ELECTRONIC MEGAPHONE and AMPLIFIER SYSTEM



COST
U.S. NAVY \$1850.00

YOURS
FOR ONLY \$89.50

• Powerful 20 watt amplifier! • Pistol grip dynamic megaphone!

All Units BRAND NEW and GUARANTEED

A complete portable 20 watt amplifier system at a fraction of its original cost! Quality is unquestionable—designed and built for the U. S. Navy! Use on fishing boats—pleasure craft—traffic control—parking lots—day camps—carnivals—sports events—life saving stations—any place where handling large crowds; or reaching large audiences is necessary. Unit operates from self contained rechargeable batteries—no power line connections necessary. May be set up permanently when used with charging rack. System consists of a 20 watt 6 tube amplifier—in a waterproof portable metal case, an electronic megaphone, a battery charger power unit that operates on 110 volts AC/DC and on 15, 24, 48, or 96 Volts DC, 5 cell 6 volt storage battery, tubes, cables, plugs and 36 page instruction and diagram book. Overall case complete 15 1/2" x 11 1/2" x 5 1/2". Shpg. wt. 55 lbs.

ELECTRONIC MEGAPHONE SYSTEM.....Net \$89.50

Lafayette Greatest Tape Buy Ever!

1200 FT. REEL
Genuine Plastic Base
RECORDING TAPE
Shpg. Wt. 14 oz.

\$1.89 per roll plus postage (95¢ insured)

LAFAYETTE made a terrific deal with one of the leading manufacturers of recording tape to supply us with their regular tape which sells for almost twice our price. **WE GUARANTEE ABSOLUTE SATISFACTION OR YOUR MONEY BACK.** The finest, professional-quality recording tape obtainable. Highest performance for thousands of playings. Red Oxide Base in a smooth, uniform coating; greater signal strength; with maximum fidelity; uniform frequency response from 40-15,000 cps.

In lots of 10 rolls - 1.75 ea

LAFAYETTE EXCLUSIVE!
DYNAMIC EAR PHONE

A new lightweight plastic ear phone especially imported by Lafayette to bring you the high quality of a dynamic ear phone with the ease and comfort of an almost weightless unit—at a price less than half that of any comparable unit. Fits right into ear. Excellent sensitivity of 65 db. Ideal for use with miniature sets, hearing aids, transcribing, etc. DC resistance 2000 ohms. Impedance 5000 ohms at 1000 cycles. Complete with 3 ft. plastic covered cord.

MS-72.....Net 1.45

LOW IMPEDANCE MODEL FOR SILENT LISTENING OR VIEWING

Will replace speaker on any radio set or TV for silent listening, by direct connection to secondary of output transformer. Impedance 8 ohms.

MS-100.....Net 1.05

ASTATIC UHF CONVERTER
channels 14 thru 53

13.95
Singly, each.....**14.45**

Below manufacturer's cost! Continuous variable tuning—14 thru 53. Operates into TV receiver channels 3-3-4-5 and 61 Two-stage preselector. Fully shielded spiral inductance tuner reduces oscillator radiation. Uses 6AF4 or 6E4 and 1N28 crystal diode. High sensitivity—low noise performance!

ASTATIC UHF—Singly, each.....14.45
In lots of 5, each.....13.95

10 DAY FREE TRIAL—MONEY BACK GUARANTEE

QUALITY HEARING AID at an UNBELIEVABLE PRICE

QUALITY BUILT FOR YEARS OF OUTSTANDING PERFORMANCE

- Completely self contained unit—including batteries slips into breast pocket.
- Extra sensitive microphone
- Tiny sensitive dynamic ear piece
- Continuously variable volume control.
- 1 position "mug" Control

Modern! Powerful! Tiny! As small as a pack of cigarettes! Only 5 1/2" x 3 1/2" x 3/4". And only 1/2 the usual price for an instrument of this quality. Weighs only 3 oz.—including the batteries! No extra bag or pouch to carry—batteries are inside the unit. Guaranteed to suit your particular hearing problem. Only Lafayette's purchasing power makes this price possible—backed by their amazing warranty. No charge replacement on any defective part (except cords and batteries) due to normal usage for 1 year from date of purchase. Complete with batteries and carrying case.

HA-100.....Net 39.50
INDUCTION MODEL
Identical to HA-100, but has built in induction coil for use with telephones.
HA-101.....Net 49.50

MINIATURE CRYSTAL MICROPHONE

Here's a typical Lafayette special for the experimenter, student or dealer. An extremely sensitive and small crystal microphone used in hearing aids and other small apparatus. Can be used as lapel mike—miniature transmitter mike for concealed locations, etc. Its size and performance gives it joint versatility. Brand new. Size only 1 1/2" x 1 1/2" x 5/16" deep. Imported to save money.

MS-108.....Net 1.95

REAR SEAT AUTO SPEAKER KIT
HEAVY DUTY
6" x 9" PM KIT

A complete kit for adding another speaker in the rear of your car. You get a 6" x 9" PM speaker with a 3.15 ohm. Alnico V magnet; a CRL PK300 three position switch so you can select either speaker alone or both together. Dial plate with mounting bracket, knob and hardware; a plastic grille (illustration A) (your choice of brown, grey or silver), wire and wiring instructions. Simple to install. Shpg. Wt. 4 lbs.

SK-36.....Net 4.50

DELUXE 6" x 9" KIT

SK-37, with chrome plated metal grille (Fig. B). Shpg. Wt. 5 lbs.

Net 5.75

5" Tweeter and Crossover Network

7.95

A specially designed 5" Tweeter and Crossover Network that will assure high frequency response when used with any speaker you now possess. You can now make your present speaker into a 3-way speaker system increasing the high frequency range up to 15,000 cycles. Diagram included. Shpg. Wt. 5 lbs.

STOCK NO. SY-14.....Net 7.95

DUAL STYLUS—TRIPLE PLAY

DIAMOND and SAPPHIRE

LIST \$34.00
Replacement for All G.E. RPL-450 Triple-Play Cartridges

Stock No. PS-29 Net 11.95

Masco
CASCADIAN TV BOOSTER
Reg. Price \$42.50



SALE 9.95

Biggest Booster Buy Ever! Famous Masco Cascade Booster!!

- Three tuned circuits—cascaded!
- Golden Grid 6BZ7 Plus 6J6 Plus rectifier!
- 35 db gain (30 times!) average on all channels!

A sensational new tunable VHF booster utilizing a special low-noise circuit. Employs the new Golden Grid 6BZ7 tube as well known for its use in cascade circuits. Field planner and specifically designed for new low noise—high gain front ends. Brings superior reception to older type receivers. Single knob control for utmost simplicity of operation. Signal strength is increased at least 30 times—35 db!—average on all channels. Rack and pinion permeability for precision stability. Automatically switched on and off by TV set. Uses cross-neutralized 6J6 and 6BZ7 tubes for maximum gain and bandwidth. U/L approved. For 110 volts AC. Wt. 5 lbs.

Masco TVB-53. In lots of 2, Net 9.45 Singly, ea. 9.95

SALE! RADIO RECEPTOR UHF CAVITUNER

Complete with 4 AF4, 6BZ7 and 1N28

Tunes all UHF channels 14-53. Most advanced engineering—three cavities, two used as bandpass pre-selector, one controlling local oscillator. Features frequency stability, uniform broad bandwidth, high selectivity, low noise, high gain. Completely shielded. Ideal for building converters, etc. Size 2 1/2" H x 4 1/2" W x 1 1/2" D. Shpg. Wt. 4 1/2 lbs.

TL-20...Lots of 2, ea. 4.45 Singly, ea. 4.95

BINOCULARS NEVER BEFORE AT THIS PRICE

IMPORTED DIRECT

Prism-Coated Lenses

- All-Metal Construction
- Individual Focus
- Leather Case & Straps

F-80—8X35 I.P.....Net 17.45
F-100—8X50 I.P.....Net 18.25
F-45—7X35 I.P.....Net 19.85
F-103—7X50 I.P.....Net 21.85
F-117—10X35 I.P.....Net 23.50
F-104—11X58 I.P.....Net 32.50
F-118—16X50 C.F.....Net 34.95

with order, Add 10% Fed. Tax

FREE send for it

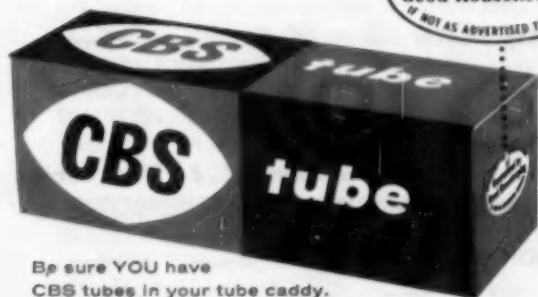
RADIO CATALOG
GET LAFAYETTE'S NEW CATALOG PACKED WITH THE LATEST SELECTION OF QUALITY ELECTRONICS EQUIPMENT AT BARGAIN PRICES

Lafayette Radio

NEW YORK, N.Y. 100 Sixth Ave.
BROOKLYN, N.Y. 542 E. 10th St.
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PLAINFIELD, N.J. 139 West 2nd St.
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DEPT. RF
Include postage with order

When Godfrey
tells the ladies
... There are
no finer tubes
than CBS tubes...
More women
than ever
are going to ask for
the tubes with the
Good Housekeeping
Guaranty Seal.



Be sure YOU have
CBS tubes in your tube caddy.

**Arthur Godfrey's Talent Scouts
to sell CBS Tubes
on both TV and Radio
every other week starting in June**

*Quality products through **ADVANCED-ENGINEERING***

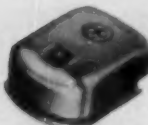
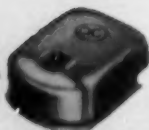
CBS-HYTRON, Danvers, Massachusetts . . . A DIVISION OF COLUMBIA BROADCASTING SYSTEM, INC.
June, 1955

PICKERING models **220** / cartridges **240**

*The Most Nearly
Perfect Phono Pickups
Ever Produced*

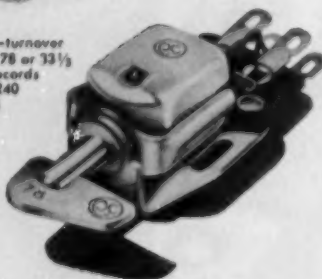
... they are sold separately for all standard arms or mounted back-to-back to make up the famous
PICKERING 260 TURNOVER PICKUP.

MODEL 220—for 78 rpm records
diamond or sapphire stylus



MODEL 240—for 33 1/3
and 45 rpm records
diamond stylus only

MODEL 260—turnover
cartridge for 78 or 33 1/3
and 45 rpm records
(the 220 and 240
back-to-back)



The **220** and **240** are engineered to maximize performance. By comparison they are without equal...

The **220** and **240** are

Lighter—5 1/2 grams

Smaller—3/8 by 3/4 by 3/8 inches

The **220** and **240** have

Highest Output—30 millivolts/10cm/sec.

More Compliance with Less Tracking Force

Lower Overall Distortion

Less Moving Mass

Wider Frequency Response

Mu-Metal Shielding for Less Hum

These characteristics have real meaning to those who understand that maximum performance depends upon components which meet professional standards. If you want the best that high fidelity can offer, ask your dealer to demonstrate the 220, 240 and 260 Pickering cartridges...

The Most Nearly Perfect Phono Pickups Ever Produced



PICKERING and company incorporated • Oceanside, L.I., New York

PICKERING COMPONENTS ARE PROFESSIONAL QUALITY

"For those who can hear the difference"

... Demonstrated and sold by Leading Radio Parts Distributors everywhere. For the one nearest you and for detailed literature; write Dept. C-7,

Preferred for modern set servicing



Service technicians get greater coverage with less investment; more practical service features; and easier, faster installation with the IRC Type Q Control. Here's a dependable, basic control that is directly designed for modern set servicing. For appearance, performance and price... there's none better. So why settle for less? Tell your Distributor you want Q Controls... most servicemen do.



This 8 page catalog gives you all the facts... Send for your free copy now—

INTERNATIONAL RESISTANCE CO.

Dept. 483, 401 N. Broad St., Phila. 8, Pa.

In Canada: International Resistance Co., Ltd., Toronto, licensee

Send me Q Control Catalog DC1D.

Name _____

Company _____

Address _____

City _____ State _____

4 KNOBMASTER FIXED SHAFT

Q Control standard shaft is knurled, flatted and slotted—fits most knobs without alteration.

5 INTERCHANGEABLE FIXED SHAFTS

Exclusive IRC convenience feature—provides fast conversion to "specials", with FIXED shaft security. 15 types available.

6 1/4" LONG BUSHING

Accommodates all small sets, yet handles large set needs perfectly.

7 STANDARD TAPERS

Full coverage of all taper requirements is provided in the Q Control.

8 94 RESISTANCE VALUES

For TV, AM and FM coverage, 94 values of plain and tapped controls are furnished.

9 QUALITY APPEARANCE

The handsome professional appearance of IRC Q Controls lets you point to your work with pride.


10 CUSHIONED TURN

The smooth, quality of "feel" of a Q Control contributes to customer confidence.

11 TYPE 76 SWITCHES

Either of two type IRC switches attached as quickly and easily as a control cover—meets all your requirements.



Wherever the Circuit Says 

Guaranteed to oscillate!
Your choice of frequencies!
Same day shipment!

**ALL CRYSTALS TESTED FOR ACTIVITY!
1-DAY SERVICE FOR EVERYTHING IN STOCK!**

NOVICE FT-243 FUNDAMENTAL
BAND FREQUENCIES

Lots of 10 or more. Ea. 99¢
Individually. Ea. \$1.25

YOUR CHOICE OF FREQUENCIES!
80 METERS 3701, 3702, 3703 through 3748
in steps of 1 KC.

40 METERS 7176, 7177, 7178 through 7198
in steps of 1 KC.

DOUBLING TO 3588, 3589, 3590 through 3599
40 METERS: in steps of 1 KC.

SINGLE SIDE BAND—FT-241-A

Low Frequency Crystals 79¢
 Lots of 10 or more. Each

400	447	446	450	453	460	459	463	466	470	474	477
440	444	447	451	454	457	461	464	468	472	475	479
441	445	448	452	455	458	462	465	469	473	476	480

MISCELLANEOUS & SHIP BAND FREQUENCIES

[illegible]

NUMBERS LISTED ARE FUNDAMENTAL
FREQUENCIES IN KILOCYCLES

FT-243 Lots of 10 or more, Ea.
 Lots of 5 or more, Ea. 79c
 Individually, Ea. 99c

69c

119	2120	2918	333	4689	5821	4375	7125	7533	7780	8025	6270	8514
1129	2575	2915	3340	4710	5845	4140	7440	7840	7783	8330	6273	9101
1130	2530	2920	3410	4730	5810	4405	7510	7541	7790	8033	6273	8520
1196	2535	2925	3420	4780	5852	4405	7161	7550	7791	8040	6289	8525
1197	2535	2925	3420	4780	5852	4405	7161	7550	7791	8040	6289	8525
1915	2535	2925	3445	4815	5873	4440	7170	7560	7805	8050	6290	8533
1930	2567	2940	3510	4920	5885	4450	7290	7566	7788	8058	6291	8540
1940	2540	2945	3525	4840	5880	4473	7208	7570	7610	8060	6300	8541
1945	2540	2945	3525	4840	5880	4473	7208	7570	7610	8060	6300	8541
1965	2570	2955	3585	4852	5900	4600	7490	7571	7720	8070	6308	8545
2015	2575	2960	3680	4880	5900	4670	7606	7620	7848	8073	6318	8560
2017	2575	2960	3680	4880	5900	4670	7606	7620	7848	8073	6318	8560
2017	2543	2937	3700	4938	5923	4675	7273	7583	7830	8075	6316	8566
2017	2543	2937	3700	4938	5923	4675	7273	7583	7830	8075	6316	8566
2025	2590	2980	3800	4950	5940	4650	7300	7591	7840	8083	6325	8573
2030	2595	2985	3845	4960	5940	4673	7308	7600	7841	8090	6330	8575
2035	2595	2985	3845	4960	5940	4673	7308	7600	7841	8090	6330	8575
2055	2655	2995	3935	5030	5973	4600	7110	7600	7858	8100	6340	8583
2060	2660	3000	3980	5035	5975	4605	7225	7610	7860	8106	6341	8585
2065	2665	3010	3990	5095	5995	4625	7333	7611	7866	8108	6350	8591
2070	2665	3010	3990	5095	5995	4625	7333	7611	7866	8108	6350	8591
2105	2685	3020	4035	5165	6005	4650	7491	7625	7873	8116	6360	8596
2125	2690	3025	4045	5180	6025	4673	7350	7630	7875	8120	6366	8600
2130	2695	3030	4060	5205	6045	4675	7355	7640	7880	8125	6370	8601
2130	2695	3030	4060	5205	6045	4675	7355	7640	7880	8125	6370	8601
2140	2710	3040	4110	5245	6050	4708	7633	7650	7890	8133	6380	8602
2190	2715	3045	4135	5295	6073	4725	7627	7653	7891	8140	6383	8621
2195	2715	3045	4135	5295	6073	4725	7627	7653	7891	8140	6383	8621
2195	2715	3045	4135	5295	6073	4725	7627	7653	7891	8140	6383	8621
2210	2755	3060	4190	5305	6108	4773	7691	7670	7900	8158	6400	8641
2250	2765	3065	4215	5327	6125	4775	7400	7673	7910	8160	6406	8641
2255	2765	3065	4215	5327	6125	4775	7400	7673	7910	8160	6406	8641
2260	2770	3075	4255	5335	6142	4785	7406	7680	7920	8165	6410	8655
2260	2775	3080	4260	5367	6158	4815	7480	7682	7925	8170		8660
2275	2780	3115	4270	5430	6173	4825	7416	7678	7930	8173	6426	8660
2275	2780	3115	4270	5430	6173	4825	7416	7678	7930	8173	6426	8660
2290	2790	3135	4330	5495	6185	4850	7433	7708	7940	8180	6430	8673
2415	2795	3140	4340	5508	6190	4873	7440	7708	7941	8183	6433	8675
2415	2795	3140	4340	5508	6190	4873	7440	7708	7941	8183	6433	8675
2435	2825	3150	4397	5582	6225	4900	7454	7734	7954	8191	6441	8683
2440	2830	3155	4445	5587	6235	4905	7458	7716	7960	8200	6450	8690
2442	2835	3160	4445	5645	6240	4925	7466	7720	7966	8206	6456	8691
2442	2835	3160	4445	5645	6240	4925	7466	7720	7966	8206	6456	8691
2455	2845	3170	4495	5675	6273	4950	7475	7730	7973	8210	6466	8704
2460	2850	3175	4535	5687	6273	4973	7483	7733	7975	8216	6470	8708
2465	2855	3202	4540	5700	6275	4975	7481	7740	7980	8220	6473	8710
2470	2860	3207	4575	5707	6275	4987	7487	7741	7982	8224	6476	8713
2475	2865	3210	4610	5725	6305	7008	7506	7750	7990	8233	6480	8720
2480	2870	3220	4620	5730	6315	7026	7508	7758	7991	8238	6483	8725
2480	2870	3225	4635	5735	6315	7026	7510	7758	7990	8241	6486	8727
2490	2880	3230	4650	5750	6335	7050	7510	7766	7997	8248	6490	8730
2495	2885	3235	4682	5760	6340	7073	7520	7771	8010	8254	6498	8743
2505	2890	3240	5000	5773	6350	7075	7525	7775	8016	8258	6506	8741
2505	2890	3240	5000	5773	6350	7075	7525	7775	8016	8258	6506	8741
2515	2905	3210	5020	5780	6373	7114			8039	8266	6518	8749

ZENITH MODEL DC-18-A 1,000 KC CRYSTAL

Built-in 12 V. automatic thermostatic controlled heating unit. 8-pin octal base. Ea. (Shipping wt. 1/4 lb.) **\$5.95**

TERMS: All items subject to prior sale and change of price without notice. Minimum crystal order: \$2.50. All crystal orders **MUST** be accompanied by check, cash or **N.O. WITH PAYMENT IN FULL, NO C.O.D.** IN ORDERING INDIVIDUAL CRYSTALS, INCLUDE APPROX. \$5 PER CRYSTAL FOR POSTAGE. Also indicate second choice frequencies wherever substitution may be made. Calif. buyers add sales tax.

U. S. CRYSTALS JUNE MISCELLANEOUS SPECIALS

RK-65
IDEAL FOR
SINGLE
SIDE BAND

Ideal for use in grounded grid circuit. Requires only 6 W. grid driving power. Operates similar to 4-250A. (See Radio Ham Book for complete details.) Guaranteed. Brand new.

500 WATTS
RAYTHEON TETRODE TUBE
Guaranteed! Brand New!

\$9.95

**LELAND
ELECTRIC
MOTOR**

Complete
with Reduc-
tion Gear
Box, reduces
to approx. 60
S.P.M. Motor Rating 110
220 V. AC 60 Cycles, 1725
S.P.M. 1/2 H.P. BRAND
NEW \$29.95

SENSATIONAL PACKAGE OFFER OF 3 RECEIVERS COMPLETE WITH TUBES & DYNAMOTORS!

75 MC RECEIVER	COMMAND RECEIVER	ARC-5 RECEIVER	ALL THREE RECEIVERS
Used, com. ship. w/ 14 lbs. Ea. \$4.95	9-9 MC With used, good cond. 1 lbs. Ea. \$4.95	9-9 MC With used, good cond. 1 lbs. Ea. \$4.95	ALL THREE RECEIVERS (W/ 40 lbs.) ONLY \$9.95

TUBES—NEW! GUARANTEED

VT-127A	2.05	78P7	2.05	\$5.00
---------	------	------	------	--------

COMMAND EQUIPMENT

THE FAMOUS "Q-Ser" 190-550 KC. With tubes. Used, good condition. \$10.95
Wt. 16 lbs.
3-6 MC. With tubes, less dial. Used, good condition. Wt. 10 lbs. \$7.95
6-6 MC. With tubes. Used, good condition. A hot buy! Wt. 10 lbs. \$4.95
EC-455 MODULATOR With tubes, good condition. Reduced! Wt. 20 lbs. \$24.45

CONDENSER SPECIALS!

CONDENSER SPECIALS!
 2 MFD. 0,000 V. CONDENSER. Used. Ea. Shp. wt.
 17 lbs. **\$6.00**
 2 MFD. 5,000 V. CONDENSER. OR RILED. BRAND
 NEW. Each. Shp. wt. 7 lbs. **\$9.00**

POWER SUPPLY COMBINATION SPECIAL

1 EA. POWER TRANSFORMER: Input 115 VAC 60 cycles. 525 Kva. Output 1120-0-1120 V. 500 MA. Manufactured by American Trans. Co. Ship. Wt. 60 lbs. BRAND NEW—Ea. **\$14.95**

1 EA. SWINGING CHOKES: 5—25 henry. 550 MA. Brand New. Ship. Wt. 19 lbs. Ea. **\$6.95**

4 EA. FILTER CONDENSERS: 4 Mfd. 1500 VDC Each, \$1.95. Brand New. All 4. Ship. Wt. 12 lbs. **\$7.80**

COMBINATION PRICE— **\$27.95**

ALL 6 ITEMS **\$27.95**
Total Ship. Wt. 91 Lbs.
Items may be purchased separately at individual prices.

CODE PRACTICE TAPE—NEW!
 REELS NO. 10, 13, 14.
 Ship. wt. 1½ lbs., ea. **\$1.25**

U.S. CRYSTALS, INC.

805 SOUTH UNION AVENUE
LOS ANGELES 17, CALIF.

RADIO & TELEVISION NEWS

CRYSTAL PACKAGE SALE!

Genuine Govt. Surplus Crystals!
Same day shipment!
Assorted frequencies!

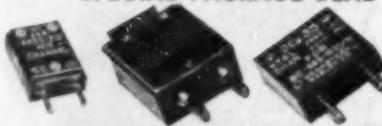
START YOUR OWN CRYSTAL BANK NOW!

U. S. CRYSTALS OFFERS THIS
GIGANTIC BARGAIN! SET UP
YOUR OWN CRYSTAL RESERVE!

SAME DAY SHIPMENT! SATISFACTION GUARANTEED!

WARRANTY! Crystals in all packages on this page are **GENUINE** government surplus crystals manufactured by **NATIONALLY-KNOWN** companies such as Billey, Piazza, Monitor, John Mech, Coor, Yellison, etc. **U. S. CRYSTALS, INC. GUARANTEES YOUR SATISFACTION OR YOUR MONEY BACK IN FULL!**

SPECIAL PACKAGE DEAL NO. 1



100
CRYSTALS!

SPECIAL PACKAGE DEAL NO. 1 CONSISTS OF:

80.....FT-243 10.....FT-171 10.....DC-34-35

MIXED FREQUENCIES!
At least 20 HAM BAND frequencies! For operation on 160, 80, 40, 20, 10, 6 and 2 meters on either FUNDAMENTAL or HARMONIC frequencies.

SHIPPING TERMS: Same day shipment! Shipping wt.: 5 lbs. Check postal zone and ADD SUFFICIENT POSTAGE to cover cost of mailing.

PEICIAL PACKAGE
DEAL NO. 1 Regular value \$49.00!
\$9.95

SPECIAL PACKAGE DEAL NO. 2

Guaranteed to oscillate! Consists of 5 choice crystals:
1—ZENITH MODEL DC-16-A 1,000 KC CRYSTAL: Built-in 12 V. automatic thermostatic controlled heating unit, 8-pin oval base. Reg. value \$5.95
1—MR-5 BILLEY, 10,000 Kc. Reg. value \$1.00
1—FT-243, 5,000 Kc. Reg. value 1.99
1—PT-241, 200 Kc. Reg. value 1.99
1—FT-241, 500 Kc. Reg. value 1.99
Total regular value \$13.91

SPECIAL PACKAGE DEAL NO. 2 **\$8.95** POSTPAID! Satisfaction guaranteed!

SPECIAL PACKAGE DEAL NO. 3

36 FT-241 LOW FREQUENCY CRYSTALS

**FOR SINGLE
SIDE BAND**

Frequency range from 370.370 Kc. to 435.195 Kc. in steps of every 1.852 Kc. approximately. Channels: 0 to 35.

SPECIAL PACKAGE
DEAL NO. 3 **\$3.95** POSTPAID! Satisfaction guaranteed!
Regular value \$14.04

SPECIAL PACKAGE DEAL NO. 4

The Biggest Crystal Bargain Ever Offered! Consists of:
1 Special Pkg. No. 1. Reg. value \$9.95 1 Special Pkg. No. 3. Reg. value \$3.95
1 Special Pkg. No. 2. Reg. value 8.95 Total value \$12.85

SPECIAL PRICE
FOR ALL 3
PACKAGES **\$19.95** POSTPAID! Satisfaction guaranteed!

SPECIAL PACKAGE DEAL NO. 5

Guaranteed to oscillate!
22 FT-241—SINGLE SIDE BAND LATTICE FILTER PACKAGE
Includes two 455KC IF TRANSFORMERS

Crystal Frequency (KC)	Crystal Frequency (KC)	Crystal Frequency (KC)	Crystal Frequency (KC)	Crystal Frequency (KC)	Crystal Frequency (KC)	Crystal Frequency (KC)	Crystal Frequency (KC)
38 440.741	42 440.148	46 455.556	50 442.963	54 470.370	58 477.778	62 444.644	44 451.852
39 442.593	43 450.800	47 457.407	51 464.815	55 472.222	59 479.630	45 446.296	45 453.704
40 444.644	44 451.852	48 459.259	52 466.867	56 474.034			
41 446.296	45 453.704	49 461.111	53 468.519	57 475.526			

Regular value: \$19.38
Same day shipment. Satisfaction guaranteed.
SPECIAL PACKAGE NO. 5 **\$9.95** POSTPAID

SPECIAL PACKAGE DEAL NO. 6

FOR SINGLE SIDE BAND

80 FT-241—LOW FREQUENCY CRYSTALS
Including One Channel 75, 500 Kc.
every 1.852 Kc.

ONE EACH
of frequencies from 370.370 to 510.667 Kc. in steps of every 1.852 Kc.
Regular value: \$63.38
Same day shipment. Satisfaction guaranteed.
SPECIAL PACKAGE NO. 6 **\$14.95** POSTPAID

SPECIAL PACKAGE DEAL NO. 7

120 FT-243

Complete with crystal storage box
Regular value \$87.75

Same day shipment.
Satisfaction guaranteed.

\$24.95



SPECIAL PACKAGE NO. 7
Ship. Wt. 9 lbs.

SPECIAL PACKAGE DEAL NO. 8

120 FT-243

Complete with crystal storage box
Regular value \$87.75

Same day shipment.
Satisfaction guaranteed.

\$24.95



SPECIAL PACKAGE NO. 8—Ship. Wt. 9 lbs.

SPECIAL PACKAGE DEAL NO. 9

CRYSTAL BANK COMBINATION SPECIAL!

Regular value: \$175.50

240 FT-243 CONSISTS OF PACKAGE DEAL NO. 7 AND PACKAGE DEAL NO. 8!

Same day shipment.
Satisfaction guaranteed.

Complete with 2 crystal storage boxes.

SPECIAL PACKAGE NO. 9
Ship. Wt. 18 lbs.

\$39.95

SPECIAL PACKAGE DEAL NO. 10

CRYSTAL BANK SUPER PACKAGE!

CONSISTS OF PACKAGE DEALS NO. 1, 2, 3, 5, 6, 7, 8!

The most colossal buy ever offered in crystal history!

Regular value: \$353.03. Includes two crystal storage boxes.
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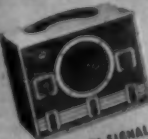
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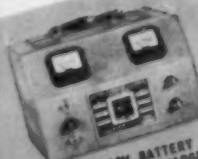


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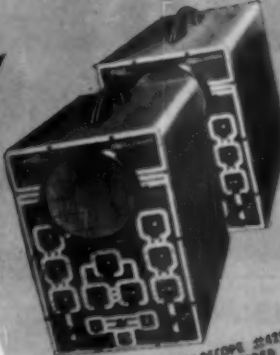
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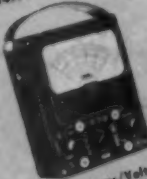
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A PROBE FOR EVERY PURPOSE

A TRANSISTORIZED LIGHT-BEAM AUDIO TRANSMITTER

By
G. B. TIFFANY
and
NATHAN O. SOKAL

"Aiming" of the transmitter and receiver is facilitated by mounting them on tripods equipped with pan-heads.

A completely transistorized version of a circuit originally described in May 1954 issue. CK721 "p-n-p" units are used.

A PREVIOUS article¹ described a light-beam audio communication system composed of a transistorized receiver and a transmitter which used vacuum tubes. The transmitter has since been transistorized, and the unit is now fully portable. The experimenter can set up communications anywhere he wishes, without need of a.c. power lines. Power consumption of the transmitter has been reduced to less than 7 watts, 60% of that of the original model, and the unit is now housed in a 6x2x3½-inch case, exclusive of batteries. Receiver sensitivity has been increased also, and reliable communication has been achieved over a distance of 800 feet.

Light-beam communication works as follows: A light source at the transmitter is made brighter or dimmer, corresponding to the instantaneous value (positive or negative) of the audio waveform to be transmitted. At the receiver, a phototransistor draws a current proportional to the amount of light reaching it from the transmitter. As the transmitter light source is made brighter and dimmer, the phototransistor current in the receiver increases and decreases. This current variation is amplified by the transistor amplifier and applied to a pair of earphones, making the signal audible.

The light from the transmitter is collimated into a narrow beam, giving good power efficiency for point-to-point communication. A narrow beam is desirable in order to send the maximum

amount of energy to the receiver, instead of radiating it in other directions, where it is not needed. The narrow beam also ensures secrecy of communication, since only those in the direct path of the beam can detect the transmission.

The light source used in the transmitter was a Sylvania R1131C glow modulator tube. This is a gas-filled tube whose glow is concentrated in a small area, about 0.09 inch in diameter. The light output is proportional to the current through the tube; varying the tube current modulates the light output. The small area of the glow makes this an ideal light source for beamed transmission, since a small source of light is required to generate a narrow beam.

The tube is rated for a maximum peak current of 55 ma., and an average current of 3 to 25 ma. Maximum output and modulation are achieved by setting the average current at 25 ma. and changing the current ± 25 ma. from the average value.

The a.c. plate resistance of an average tube is about 300 ohms at 500 cps, which is about the frequency where maximum audio energy occurs. A current change of ± 25 ma. in a resistance of 300 ohms represents a power of about 100 milliwatts, assuming a sine-wave signal. This is the power required to modulate the glow tube output in the shunt-fed circuit of Fig. 1. (The tube the authors used had a plate resistance of about 900 ohms and re-



quired about 300 milliwatts.) The signal source applies an a.c. voltage to the glow tube, causing an a.c. current to flow in the tube. The inductive "B+" feed offers high impedance to the a.c. signal, and little a.c. current is diverted to the "B+" supply.

The easiest way to get the required 100 (or 300) milliwatts for modulation of the glow tube is from a push-pull class B amplifier, as shown in Fig. 2, since a single-ended class A amplifier cannot deliver so much power with-

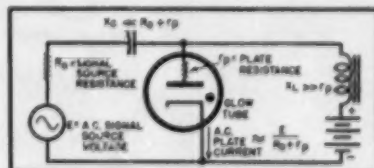
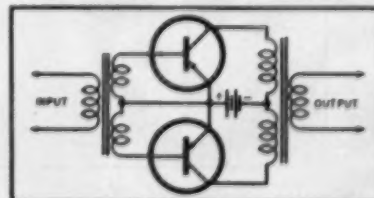


Fig. 1. Modulation of the glow tube output.

Fig. 2. Push-pull class B amplifier which serves as "signal source" of tube, Fig. 1.



Note: T_1 and T_2 are hooked up opposite from normal. Primaries serve as secondaries and vice versa.

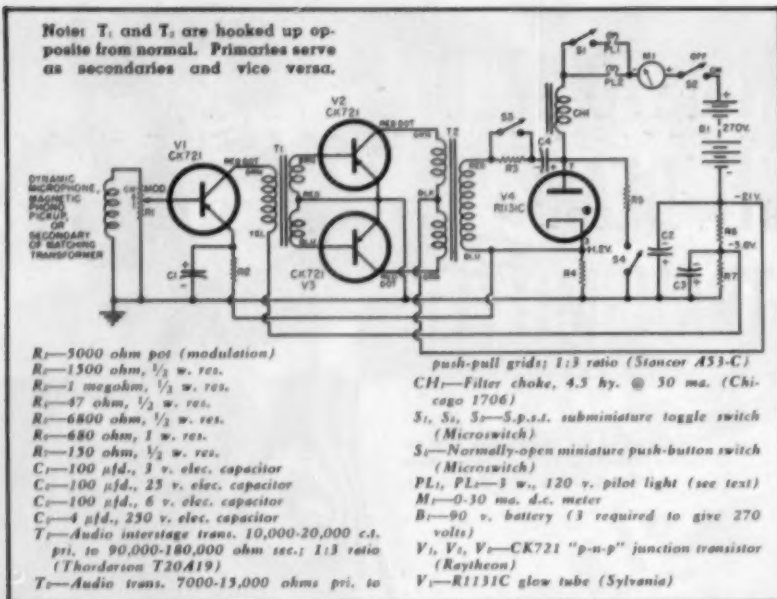


Fig. 3. Complete schematic diagram of the transistorized version of the transmitter.

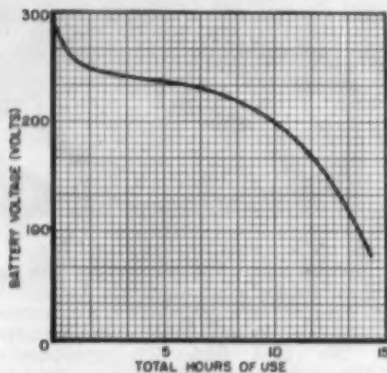
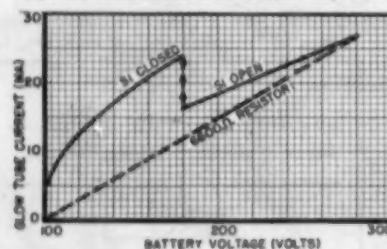


Fig. 4. Battery voltage vs hours in use, based on operation of two hours a day.

out exceeding the manufacturer's ratings on collector dissipation and/or collector voltage and/or collector current. Power transistors capable of delivering this amount of power in class A single-ended operation are still too expensive for the average experimenter.

Operation of the class B transistor amplifier³ is quite similar to that of a class B vacuum-tube amplifier. A full description can be found in any

Fig. 5. Glow-tube current vs battery voltage for the transmitter circuit, Fig. 3.



of the standard texts^{4,5}. Briefly, both transistors are normally biased to cut-off. As can be seen in Fig. 2, both bases and emitters are returned to ground, so that the collector currents are almost zero. A signal on the primary of the input transformer drives one base positive and the other base negative, because of the push-pull connection of the secondary. The positive base cuts off its transistor, while the transistor with the negative base is turned on. When the signal polarity reverses, the transistor which was conducting is cut off, and vice-versa. Thus the two transistors work alternately for positive and negative swings of the input signal on the primary of the input transformer. The main difference between the transistor and the vacuum-tube class B amplifiers is that the transistor presents a low impedance to the input transformer as soon as the base is made negative, while a vacuum-tube grid remains high-impedance until zero-bias is reached. Thus the loadings on the input transformer are considerably different for vacuum-tube and transistor amplifiers.

The class B stage can be driven by an ordinary single-ended class A stage whose output transformer secondary is center-tapped. The class A amplifier, in turn, can be driven from the source of audio signal, such as a microphone or phonograph. Highest gain is obtained if the source impedance is matched to the transistor input impedance. 500-ohm microphones or 100-millihenry magnetic phonograph pickups fill the bill fairly well; other sources should be brought to an impedance level of about 1000 ohms by the use of matching transformers.

The complete schematic diagram for the transmitter is shown in Fig. 3, incorporating all the circuits discussed

before, plus a few more to be described in the following paragraphs.

Power Source

Batteries are the most convenient source of power for portable equipment and are used in this design. In a total space of about $3\frac{1}{2} \times 3\frac{1}{2} \times 4$ inches, three 90-volt "B" batteries supply 270 volts to operate all circuits. Battery life is determined partly by how well the equipment will operate with partially-discharged batteries. A typical curve of battery voltage vs hours of use is shown in Fig. 4. Obviously the useful battery life will be longer if lower output voltage can be tolerated. A conservative value of battery end-of-life is 65% of nominal voltage; thus good battery life can be obtained if the circuits will work properly when the 270-volt power supply has decayed to 176 volts. The circuit features to be described make possible operation down to about 130 volts, and expected battery life is 13 total hours of operation, when used for two hours per day⁶. Larger batteries will last longer, of course.

The voltage across the glow tube is less than 150 volts at any current within the operating range of 3 to 55 ma. In order to make current flow in the tube, the battery voltage must then be equal to or greater than 150 volts. 65% of nominal battery voltage will be 176 volts, and there will still be sufficient voltage to operate the tube at the end of battery life. However, the wide variation in battery voltage during life (see Fig. 4) would cause excessive variations in tube current. This trouble is avoided by providing the two 3-watt, 120-volt lamps between the battery and the shunt-feed choke, shown in Fig. 3. The lamps have a regulating action, tending to keep the current constant. This is shown in Fig. 5, a graph of tube current vs battery voltage for the circuit of Fig. 3; the dashed line shows for comparison what the current would be with a 6600-ohm fixed resistor instead of the lamps. When the current decays to about 15 ma., switch S_1 can be closed, taking us to the upper curve of Fig. 5, and back to 25 ma. tube current. When the current then reaches about 12 ma., the batteries can be replaced and S_1 opened. If more precise current control is desired, a 7500-ohm, 4-watt rheostat can be substituted for the lamps and S_1 .

A minimum of 225 volts should be provided to light the glow tube when the power is turned on. Obviously the battery cannot do this when its voltage has fallen below 225 volts, part-way through life. S_2 , a normally-open push-button switch, can be momentarily pushed and released to light the glow tube if the battery voltage is not adequate. Closing S_2 causes d.c. current to flow in the shunt-feed choke. When S_2 is opened, the inductive "kick-back" of the coil generates enough voltage to light the tube. The tube conducts at a lower voltage than is required for arcing across the switch

contacts, so the switch is in no danger. An inductance of $\frac{1}{2}$ henry or more at 25 ma. is satisfactory. S_2 should be open when the unit is being turned on, to prevent the initial surge on the glow tube from being coupled to the class B transistors, thus avoiding possible breakdown of the collector junctions. S_2 may be closed after the glow tube lights.

Optical System

The light glow of the glow modulator tube is placed at the focus of a condensing lens to project the light in a narrow beam. The authors used a double-convex lens of about 1 $\frac{1}{4}$ inches diameter and 1 $\frac{1}{4}$ inches focal length; the measured beamwidth was 5 degrees. The receiver used a 6 $\frac{1}{2}$ -inch condensing lens to collect light from the transmitter beam. The sensitive spot of the receiver phototransistor should be placed at the focus of the receiver lens. Try moving the phototransistor forward and back to find the position of best focus, and move the light spot side-to-side, and up and down on the sensitive surface to locate the point of maximum response. The circuit used in the receiver is shown in Fig. 6; it is an improved version of one described in a previous article.¹

Those who read the article in the May issue will immediately recognize this new circuit as a more elaborate version of the earlier unit. Another stage has been added which requires the inclusion of another plate-to-line transformer and the addition of another transistor. While these refinements increase the cost of the completed unit somewhat, the improved performance offered by this unit outweighs the expense.

The receiver itself is no more difficult to build than the original unit although it may be necessary to obtain a slightly larger housing for the receiver to accommodate the added stage and its associated transformer. The best procedure to follow would be to obtain your transformers first and then determine the maximum over-all chassis space that will be occupied by the transformers and the few additional parts that will be required. In any event, the completed unit will be compact since the use of transistors permits "crowding" of parts as there is no heat-dissipation problem.

Aiming the transmitter and the receiver is made much easier by mounting them on photographic tripods equipped with pan-heads. This is easily done by bolting, onto the base of each unit, a $\frac{1}{4}$ " plate with a $\frac{1}{4}$ "-20 tapped hole to receive the tripod screw.

Components

Inexpensive condensing lenses can be obtained from Edmund Scientific Corp., Barrington, N. J. or A. Jaegers, Lynbrook, N. Y. Raytheon CK721 transistors were used by the authors, although any other p-n-p units should be satisfactory, such as Sylvania, Radio Receptor, or RCA 2N34's, or Raytheon CK722's. The n-p-n transistors can be

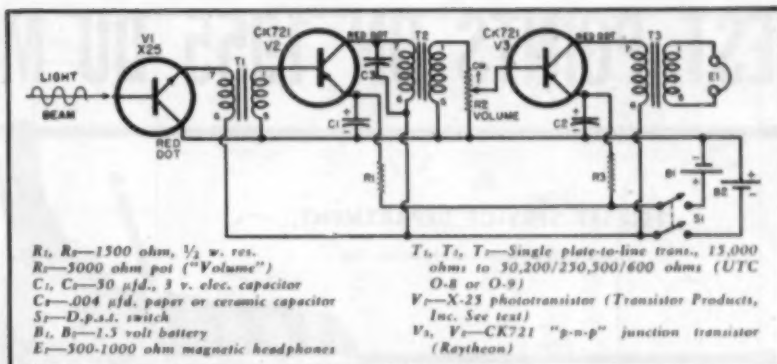


Fig. 6. An improved version of the transistor receiver described in the May, 1954 issue.

used if the battery polarity is reversed from that shown in Fig. 3; this will also require changing the polarities of the electrolytic bypass capacitors, the glow tube, and the meter. Transformer turns ratios are shown on the schematic diagram of Fig. 3. The authors used Stancor A53-C and Thordarson T20A19 units although other similar transformers should prove satisfactory, and lower-impedance transformers would be even better. The glow modulator tube was a Sylvania R1131C. Subminiature Microswitch units were used for S_1, S_2, S_3 , and S_4 , and the 1-inch panel meter was made by International Instruments, New Haven, Conn. (Standard-size components would work equally well, of course.) Three Eveready 490 or Burgess N60 batteries in series provide the 270-volt power supply.

Phototransistors for the receiver are now available from Texas Instruments, Inc., Dallas 9, Texas (Type 800), Scientific Specialties Corp., Boston 35, Mass. (Sensiton phototransistor type SS7), and Radio Receptor Co., Inc.,

New York 11, N. Y. (Type RR66), as well as the original supplier, Transistor Products, Inc., Waltham 54, Mass. (Type X-25). Emitter and collector connections of the RR66 should be interchanged from those shown in Fig. 6, since this is a "p-n-p" transistor. The base lead may be left unconnected.

The authors wish to thank Messrs. F. Campbell (W1ABV) and M. Woronoff for their expert mechanical assistance.

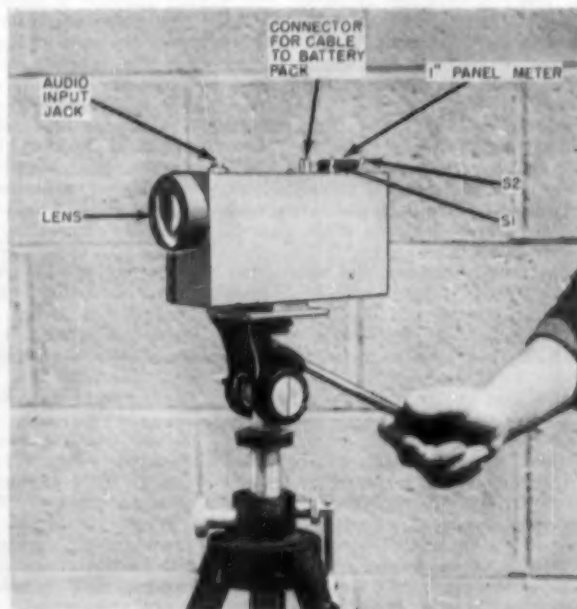
A commercial version of this device will be manufactured by The Photocontrols Co., 258 East Street, Lexington 73, Mass. Kits are available for the experimenter to assemble.

REFERENCES

1. Kenn, V. and Sokal, N.: "A Transistorized Light-Beam Communications System," RADIO & TELEVISION NEWS, May, 1954.
2. Ghandi, B. K.: "Design of Transistor Power Amplifiers," Electronics, March, 1954.
3. Reich, H. J.: "Theory and Applications of Electron Tubes," McGraw-Hill Book Co., Inc., N. Y., 1939, Chapter 9.
4. Arguimbau, L. B.: "Vacuum-Tube Circuits," John Wiley and Sons, Inc., N. Y., 1948, Chapter 4.
5. Calculated from data in "Battery Engineering Data," National Carbon Co., N. Y.

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Close-up view of the unit mounted on tripod with all of the external components identified. Note the panel meter mounted so that it is readable from the top by person operating the light-beam equipment.

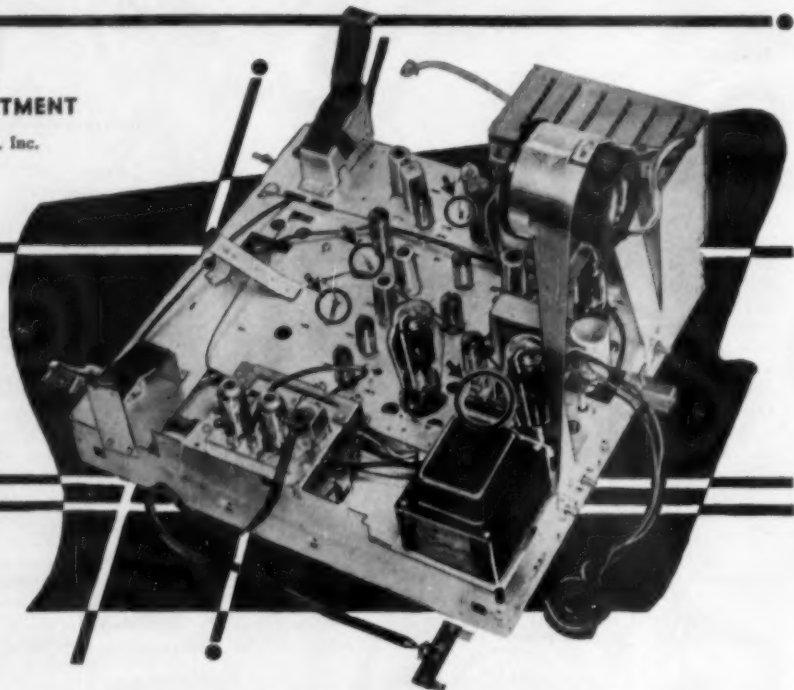


TEST POINTS ON 1955 DU MONT TV SETS

By
TELESET SERVICE DEPARTMENT

Allen B. Du Mont Laboratories, Inc.

Tracking down a. g. c. and intermittent sync troubles can be speeded up by using the test points provided.



This is the 1955 Du Mont TV chassis whose test points are discussed here.

MUCH information regarding receiver performance can be obtained by making use of the test points provided on top of the chassis. As shown in Fig. 1, leads brought up through holes in the chassis serve as test points for the r.f. a.g.c., i.f. a.g.c., video detector output, and a.f.c. circuit. Properly used, these points can be of great value in locating and correcting trouble.

Video Detector Output

Fig. 2A illustrates the waveform that should normally be observed on an oscilloscope connected to the video detector output test point. Observation at this point is important for several types of receiver troubles.

One troublemaker that can easily be detected by observing the waveform at this point is hum modulation in the r.f. or i.f. circuits. Usually, hum modulation can be recognized by the characteristic wide, dark bars that extend horizontally across the picture. One dark bar covering approximately half of the picture appears if the hum is at 60 cycles, and two dark bars separated by a light area are seen if the hum is at 120 cycles.

Sometimes, however, the hum is not severe enough to cause noticeable hum bars on the picture. In such cases, the defect is usually evidenced by vertical rolling that occurs intermittently. The service technician is logically led to believe that the trouble in such cases is in the vertical sync circuits, and much time can be lost in looking there for the trouble. This time can be saved by checking the video detector output waveform before troubleshooting the sync circuits. Even a relatively slight amount of hum modulation on the signal shows up as a waveform that is "S"-shaped, rather than straight, along the horizontal axis. The effect is shown

accentuated in Fig. 2B. Much less distortion than this can cause poor vertical hold.

The reason that the vertical roll is intermittent is because the peaks and troughs of the hum are made to move along the video i.f. waveform by the difference in phase between the power line and the transmitted signal. When the phasing is such that the vertical sync pulse amplitude is less than the other portions of the signal, as in Fig. 2B, the receiver loses vertical sync. Under the opposite condition of phasing, the receiver locks into synchronization. A tube with heater-to-cathode leakage, located in the r.f. or i.f. circuits, can cause 60-cycle hum modulation. A defective filter capacitor can result in 120-cycle modulation.

Other defects in the circuits preceding the video amplifier can also be detected by observing the video detector output waveform. For example, the waveforms of Figs. 2C and 2D show two different types of a.g.c. trouble. Sync compression is indicated by Fig. 2C. With this condition, the picture appears excessively dark, and if the compression is severe enough, the picture will lose sync. An improperly adjusted "Dumonitor" control (see Fig. 3) or a partial short across the i.f. a.g.c. line can cause this effect.

White compression is indicated by the waveform of Fig. 2D. The picture under this condition will have a "washed out" appearance and a deficiency in contrast. An improperly ad-

justed a.g.c. delay control or a short across the r.f. a.g.c. line can cause this effect during reception of a strong signal.

Further information regarding the effects illustrated in Figs. 2C and 2D can be obtained by making use of the r.f. and i.f. a.g.c. test points.

R.F. and I.F. Test Points

These test points are located physically as shown in Fig. 1 and electrically as shown in Fig. 3. Under the conditions illustrated in Figs. 2C and 2D, improper voltages will appear at the a.g.c. test points, serving as verification that trouble exists in the a.g.c. circuits. The a.g.c. voltages that should be obtained with a wide range of signal inputs to the receiver are plotted in Fig. 4.

As indicated in the partial schematic of Fig. 3, the "Dumonitor" control affects both the i.f. and r.f. a.g.c. when the "L-D" (local-distant) switch is in the "D" position. Accordingly, the curves of Fig. 4 are plotted with the "L-D" switch set in the "L" position to eliminate the effect of the "Dumonitor" control setting. Two sets of curves are shown. The dashed curves apply when the a.g.c. delay control is rotated completely clockwise (maximum delay), and the solid curves apply when the control is rotated completely counterclockwise (minimum delay).

It should be noted that neither of the control settings used in plotting Fig. 4 provides optimum a.g.c. condi-

Editor's Note: The July issue and succeeding issues of RADIO & TELEVISION NEWS will carry articles on the test points built into the 1955 television chassis of other popular makes. Since a "speaking acquaintance" with these test points and their function can save the technician valuable servicing time, we recommend that you follow this series closely. Next month the new Emerson television chassis will be discussed.

WHY THE NARTB CURVE FOR MAGNETIC TAPE?



By **W. E. STEWART**

Director of Engineering, The Malco Co., Inc.

The standard, as set by the NARTB, applies solely to 15 ips recordings. Although standards for other speeds have not as yet been approved, same principles can be applied to them.

IN OUR daily work with tape recorders it is often easy to forget some of the fundamentals. For instance, in order to obtain the frequency characteristics of a particular head and tape combination we may run a curve by putting a constant audio current into the head and then playing back the resulting signal on the tape. We then say that we will equalize for this characteristic by placing half the compensation in the recording amplifier and half in the playback amplifier. This is especially handy when the same amplifier serves for both recording and playback, as is often the case. However, we have greatly over-simplified the situation by doing so. What happens when the tape is put on another machine with different characteristics? The answer is often disconcerting. Are we using the tape to its best advantage? We usually don't know. It was in an attempt to derive some reasonable answers to these questions that the NARTB Subcommittee did its work and came up with the standard now in use.

The recording and reproduction of audio material involves the balancing of three basic qualities. These are: frequency response, distortion, and signal-to-noise ratio. Thus, if lower distortion is desired it usually means

recording at a lower level, thus sacrificing signal-to-noise ratio. We can reduce the noise level further if we restrict the frequency range, etc. In well

EDITOR'S NOTE: Although in many instances the NARTB standards refer to a specific playback curve, basically the standard is confined solely to the characteristics of the information that is recorded on a tape. The standard applies solely to the tape. The idea, of course, is to standardize all tapes so that they can be used on any machine. Actually, in view of the variation between recording heads, one will find that the recording and playback sections of tape recorders will vary between manufacturers. Even though there is such variation, all still follow the NARTB standard in that the characteristic of the recorded material on the tape is the same—irrespective of the machine used.

designed systems, either disc or magnetic tape, the recording medium is used to its maximum utility and becomes a limiting factor.

To use a recording medium to best advantage, it is important to know its behavior during the recording process.

* The author was a member of the NARTB Subcommittee on Magnetic Recording Standards from May 1948 to June 1953; the last year as chairman. It was through this period that the present NARTB magnetic recording standards were formulated and accepted by the industry. During this time Mr. Stewart was manager of Broadcast Audio Engineering at RCA Victor Division, and was actively engaged in the design of professional disc and tape recording equipment.

Fig. 1. Graph of recording losses.

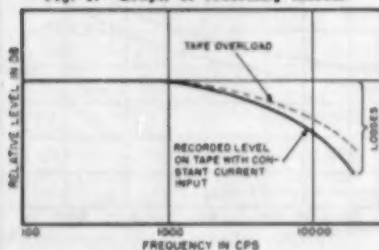
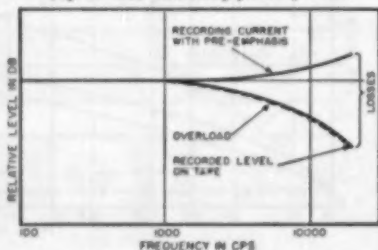


Fig. 2. The recording pre-emphasis.



In disc recording it has always been possible to examine the record by eye, usually aided with a low-power, calibrated microscope, and determine the limiting conditions. Maximum lateral excursion, over-cutting, relative amplitude at different frequencies, etc., can be easily observed. In magnetic recording, such visual checks have been impossible and other measuring methods have not been developed to the point where they are well understood or easy to apply. However, methods are available and it is hoped that they will become better understood and more widely used.

The NARTB equalization curve was developed with the philosophy that the record on the medium (that is, the recorded tape) is the most important point to standardize, since it is the item that is transferred from one machine to another.

Starting with this premise and ignoring the measuring problems for the moment, let us see what can be put on the tape to obtain the highest possible signal-to-noise ratio across the whole audio band without excessive distortion. If we take a typical magnetic tape and run a series of distortion curves on it we will find that it overloads at somewhat lower levels as the audio frequency increases. In other words, the overload characteristic of the tape drops at the higher frequencies. This statement is admittedly rather general, but it is close enough to the facts to serve as a starting point.

It will be noted that this is expressed in terms of the *record on the tape*. The recording process has several losses that are not constant with respect to frequency, so we cannot say that constant current recording gives a flat signal on the tape. Fig. 1 gives typical conditions during recording.

These losses include eddy current, stray capacity, resonance, etc., in the head and circuit as well as those due to the so-called demagnetizing effect of the ultrasonic bias currents used in most audio recording. These losses vary with the amount of bias, frequency of bias, type of tape, tape speed, etc. Thus, if a constant current is fed into the head, the recorded level on the tape is far from flat.

This condition obviously does not use the magnetic tape to its fullest extent at the higher frequencies. In order to record a signal at full level on the tape, regardless of frequency, it is necessary to "pre-emphasize."

Fig. 2 shows the results if we pre-emphasize just enough to bring the maximum recording level to the overload point at all frequencies.

However, another factor is involved. The recordist learned long ago that it is not necessary to assume that all audio material reaches the same amplitudes at all frequencies. Studies have shown that the maximum energy content of speech and music at different frequencies reaches the approximate relative values shown in Fig. 3.^{1, 2}

There are a few notable exceptions to this curve. For instance, pipe organs and some other instruments have very strong low-frequency energy and applause has strong high-frequency energy content. The skilled recordist will take these into account by backing down the recording level. Ignoring the special cases, it appears from Fig. 3 that we are not recording at the full level available on the tape if we simply pre-emphasize for the recording losses. It appears that at 10,000 cycles the loudest sounds will be recorded somewhat below the capability of the tape; and that at 50 cycles there is also a margin. In the fight to keep the signal high above the noise level the recordist would like to use the tape to its fullest capability. Hence, he uses still more pre-emphasis. At the high frequencies he "tips it up" as much as he feels he can without overloading the tape. At the low end he would like to leave it alone (for organ music, etc.), but he is plagued with 60-cycle hum pickup in the playback, so he tips up the low frequencies to override the hum a little more.

The result is a recording current curve somewhat like Fig. 4.

If a 1000 cycle signal were to be put into such a recording amplifier and adjusted to maximum recording level; and then the same level signal at 10,000 cycles put into the circuit, it is obvious that the tape would be overloaded, due to the pre-emphasis incorporated in the amplifier. For this reason frequency response measurements must be made at levels well below the maximum recording level. However, when voice or music are put into the recording amplifier and adjusted so the peaks are just reaching the overload point, the recordist knows that he can normally expect these peaks to be tones in the middle frequency range of 500 to 3000 cycles, and that any extremely high- or low-frequency peaks will be well below this.

The foregoing explains what is generally considered good recording practice. However, there were several reasons why it did not seem feasible to establish a recording standard in terms of the recording pre-emphasis curve. One of the simplest is the fact that the only way to check such a

curve is by playing the recorded material back through a calibrated playback head. Since a calibrated playback head must be used anyhow, why not establish the standard in playback terms? This is what the NARTB recording standard has done.

To understand the problem of calibrating a playback head it is necessary to review the behavior of such a device. If we make a large head with a smoothly rounded face in close contact with the tape, laminated core structure, good coupling between core and coils, and an infinitesimally short gap, we will obtain a straight line relation between the head output and frequency. If the signal on the tape is at the same level at all frequencies, the output of the head will be a straight line rising 6 db per octave (20 db per decade) as shown in Fig. 5.

However, no head is ideal and there will be some loss due to eddy currents, winding capacity, etc., which we call frequency losses because they are a function of frequency. There is another group of losses called wavelength losses. At the high frequency end these are mostly caused by the fact that the gap must have finite length. These change their frequency relationship when the tape speed is changed and this gives us a method for measuring them. There can also be wavelength effects at the low frequencies, but if the head is large, and the tape is in good contact with the face for a sufficient distance on either side of the gap, these effects can be made negligible. The construction and calibration of such a head takes considerable skill and the laboratory procedure must be gone through enough times for the experimenter to be familiar with the various pitfalls, such as azimuth misalignment, overloaded tape, hum interference, etc.

Nevertheless, the NARTB committee eventually found that several laboratories could obtain the same results, and at least one method outlined in the final standard appeared to be entirely practical.

Note that the curve of Fig. 5 is not the usual playback curve taken with constant recording current, but one taken with constant level on the tape.

It is recommended in the standards that a head with a short gap be used

Fig. 6. Response of compensation circuit. NARTB standard reproducing characteristic.

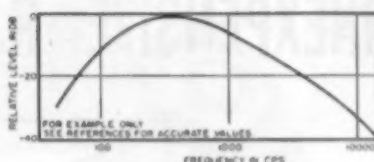
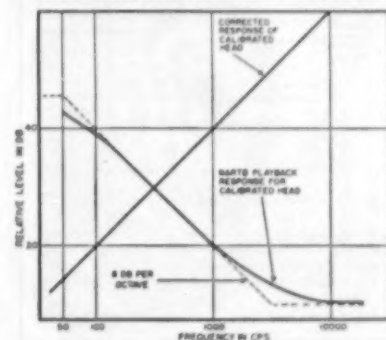


Fig. 3. Relative volume range at the different frequencies for speech and sound.

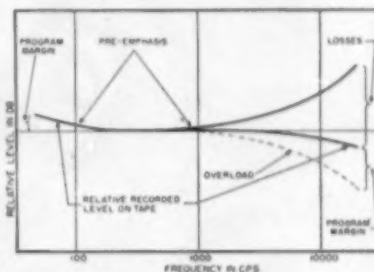


Fig. 4. Recording pre-emphasis. See text.

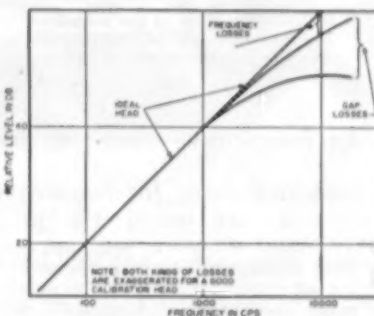


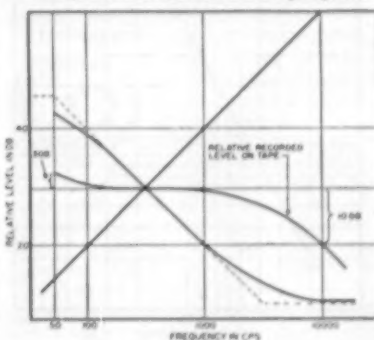
Fig. 5. Playback response (signal, flat).

that has not over 5 db "gap loss" at the highest frequency to be calibrated. Frequency losses are expected to be very low, but should be checked. A simple RC network can usually be used to compensate for the losses at the high frequencies so the response is corrected to a straight line with a 6 db per octave slope over the calibration range.

If a flat signal is then put on the tape and a compensation circuit is placed in the playback amplifier with a response which drops 6 db per octave as frequency increases, flat output re-

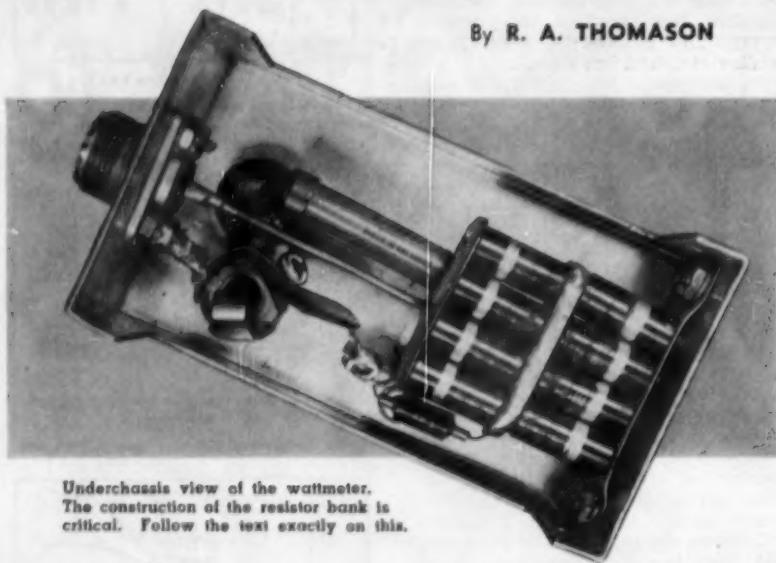
(Continued on page 112)

Fig. 7. NARTB standard recorded level on tape. All curves are for 15 ips speed.



INEXPENSIVE R. F. WATTMETER

By R. A. THOMASON



Underchassis view of the wattmeter. The construction of the resistor bank is critical. Follow the text exactly on this.

An inexpensive circuit to be used in conjunction with a standard v.o.m. for two-way communications service work.

SERVICING of two-way communications equipment is rapidly becoming an important source of income to many technicians. The quality of the service the customer demands on this type of equipment requires a sizable investment in special test instruments useful only for this type of work. The r.f. wattmeter described here will fill the need for one of these instruments at moderate cost. It is intended for use in the following cases:

1. In the shop where a limited amount of two-way service is done,

and a more accurate instrument is not justified.

2. In the field where a minimum of test equipment is carried.

The unit is built into a Bud aluminum "Minibox," and is very compact (4" x 2 1/4" x 2 1/4").

A Simpson 260 on the 100 micro-ampere scale is used as an indicator of power. Other meters could be used here, of course; however, the calibration charts shown will not apply unless the instrument has the same sensitivity as the Model 260. The unit would

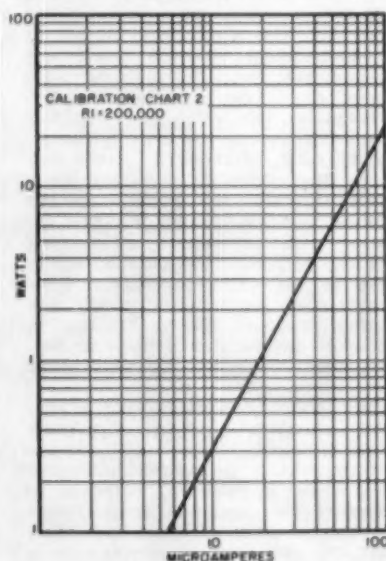
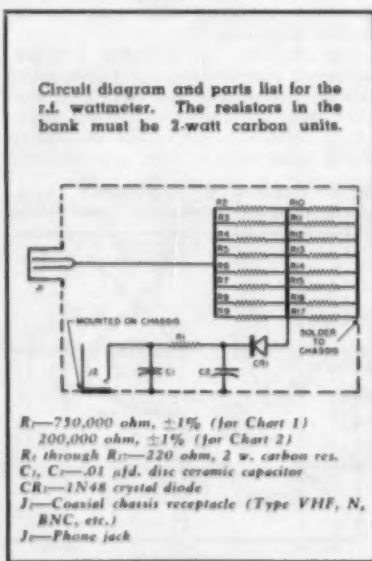
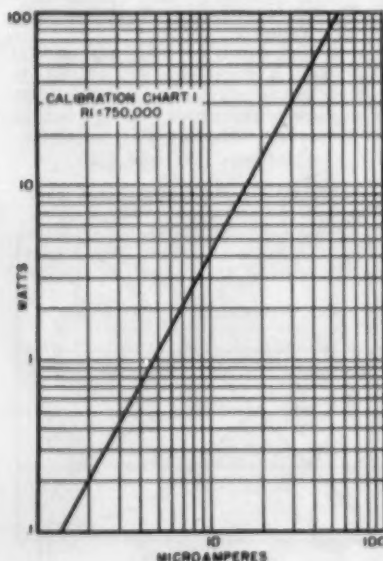
be handier if it had its own meter built-in, calibrated directly in watts.

The parts layout can be seen from the photograph and is not critical except for the resistor bank R_2 through R_{10} . These resistors are 220-ohm, 2-watt carbon units. If it is not certain that the resistors selected are carbon, one should be broken. Wirewound resistors will not work here. In the resistor bank, the idea is to keep all leads short in order to avoid any inductive reactance. The bracket is made from four pieces of thin brass shim stock material. Each piece should be cut about two inches square with eight holes drilled in two columns, using a #68 drill. Centers are spaced the diameter of one resistor. Two banks of eight resistors are then made by threading the wires through the shim stock at each end. The wires are trimmed to about one-quarter inch and bent over. They are then soldered with a large hot iron, to avoid burning the resistors. The shim stock is trimmed down to the size of the bank, with the exception of one end which is left large enough for mounting the completed bank. At least four mounting bolts should be used here. The two banks are soldered together, being careful not to overheat the resistors.

If it is desired to have the watt-meter cover both ranges as shown in Charts 1 and 2, a switch could be installed to change the value of R_1 . A switch with low resistance contacts should be used.

Chart 1 is calibrated up to 100 watts; however, the unit should not be permitted to operate at the higher powers except for a few seconds at a time since the resistor bank is only rated at 32 watts.

Several of these units were built and used with different Model 260 meters. The accuracy held within 10% over a frequency range of 4 to 170 megacycles. If a meter of known accuracy is available, it should be used to check the accuracy of the charts. -30-



D.C. TELEVISION INSTALLATIONS

By
WALTER H. BUCHSBAUM

Television Consultant
RADIO & TELEVISION NEWS

MANY service technicians have never encountered the problem of d.c. installations, simply because their localities are wired for 117 volts a.c., which is the power used by all standard model TV receivers. In some of the older areas of electric power service, however, d.c. power is furnished and TV receivers as well as all other appliances must be suitable for d.c. operation. In addition to the areas using 117 volt d.c. lines, there are also many instances of battery power sources such as trucks, trailers, boats, wind-driven generators charging up storage batteries, and similar situations. Whether the installation takes place in a house trailer, an exhibition or showroom-type truck, or simply in a home with d.c. power lines, the methods and equipment used are the same.

There are some TV receivers which are designed to operate from d.c. power lines. A few receivers feature a.c.-d.c. operation. This article will consider only the case where an "a.c. only" type TV set is to be used with a d.c. source. The methods described here are applicable to 117 volt d.c. power line; 32, 24, 12, and 6 volt battery; and generator systems.

Inverters

The means of operating an a.c. device from a d.c. source is often called an inverter, converter, or a.c. generator. However, since only the word inverter applies exclusively to the device used for d.c. to a.c. conversion, it probably is the most generally used term. By connecting an inverter between the d.c. source and the TV receiver, the latter can be operated in the conventional manner. Actually there are some difficulties connected with this arrangement but before going into detail, consider the operation of the inverter itself.

Most service technicians familiar with auto radio repair work have already had contact with an inverter. In the car radio, power from the 6 or 12 volt battery is used to drive a vibrator, and the a.c. output of the vibrator is then stepped up by the power transformer. Basically, many inverters are nothing more than a vibrator and a power transformer with the necessary fuses and switches added.

There is one inverter, the Carter "Converter," shown in Fig. 1, which operates on a different principle. In this unit there is a d.c. motor driving an a.c. generator whose output is 115



Fig. 1. A motor-generator type inverter. These units furnish a good sine-wave output with little interference.

Running an a.c. TV receiver off d.c. power lines or batteries is no problem if you know the proper type of inverter to use and what to do about interference.

volts a.c. The exact frequency depends on the speed of rotation of the generator and the d.c. input voltage, so that variations in d.c. line voltage result in variations of the a.c. output frequency. A separate, remotely located speed control, such as shown in Fig. 1, can be adjusted for best operation. The inverter itself can be located under the TV set or in a nearby closet, and the speed control can be placed near the controls of the TV set. In most instances, the adjustment will not have to be made too often.

The Carter "Converter" does not

Fig. 2. A typical vibrator-type inverter with excellent frequency stability.



need an external interference filter and should operate satisfactorily with most TV sets. It is available in 6, 12, 28, and 115 volt d.c. versions with power capabilities ranging from 100 to 300 watts, sufficient to operate even a TV-radio-phonograph combination.

A completely different principle is used in the ATR television inverter shown in Fig. 2. The circuit diagram of this unit is shown in Fig. 3, and is typical of the vibrator type. One of the features of this unit is the use of r.f. filters both in the input and output circuit. The input filter, LF_1 , removes any interference which might ride in on the d.c. line due to motors or other electrical devices. The secondary filter, LF_2 , removes the harmonics generated in the vibrator circuit and helps assure a good 60 cps sine-wave output.

The main frequency-determining element in this inverter is the time constant of R_1 and C_1 which determines how the power is applied to the relay coil connected to terminals 3 and 4 of the vibrator. To get a good sine wave from the square-wave output of the vibrator, transformer T_1 is resonated at 60 cps through capacitors C_2 , C_3 , and C_4 . Switch S_1 allows the service technician to select the output voltage from four taps of the transformer. This switch should be adjusted for about 117 volts with the TV receiver operating.

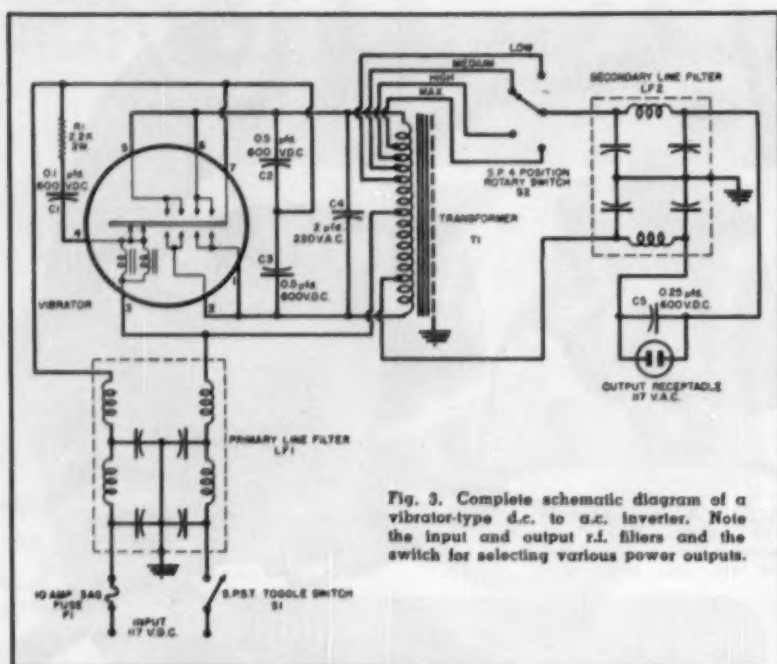


Fig. 3. Complete schematic diagram of a vibrator-type d.c. to a.c. inverter. Note the input and output r.f. filters and the switch for selecting various power outputs.

A somewhat different type of inverter is the Cornell-Dubilier "Powercon," shown in Fig. 4. The Model 110RT25 has two unique features which the service technician should know about. One is the frequency control which is accomplished by the adjustment knob visible at the top of the unit in Fig. 4. The other feature is a "phantom switch" which automatically turns the inverter on and off as the TV receiver is turned on or off. When the cover of the Model 110RT25 is removed, the two features are visible, as shown in Fig. 5. The special adjustable-frequency vibrator is shown plugged in at the rear, a 60 cps transformer with three taps is in the center, and the "phantom switch" is being inserted in the foreground.

The mode of operation of the "phantom switch" is apparent from the diagram in Fig. 6. When the TV set is connected and turned on, a small amount of d.c. passes through the TV power primary (or heater circuit) and this activates a sensitive relay which closes the d.c. switch to the vibrator. Since this d.c. is on the order of 1 milliamperes, it will not affect the TV set operation. Note that a blocking capacitor separates the d.c. source from the a.c. power. This capacitor is a large electrolytic which has very low a.c. impedance and low d.c. leakage.

The adjustable-frequency vibrator and transformer circuit is shown in Fig. 7. In order to control the frequency with a simple potentiometer, the vibrator coil and contacting reed are specially designed and regular vibrators cannot be used. The circuit of Fig. 7 does not include the r.f. interference filters which are included in both input and output of the "Powercon." These filters are essentially

similar to those shown in the circuit of Fig. 3.

Servicing Inverters

Generally, the part that becomes defective most often in a vibrator-type inverter is the vibrator itself. When working on such a problem it is absolutely essential that an exact replacement part be used. In rotary inverters, the most likely defect is deterioration of the brushes, and burnouts or shorts in the winding, commutator, etc. These troubles are electrical rather than electronic, and anyone familiar with electric motors and generators will be able to work on them.

In addition to the vibrator in inverters using them, the r.f. filter or one of the capacitors in the circuit may become defective. Simple ohmmeter checks will suffice to indicate whether electrolytic capacitors are good or whether a capacitor is shorted. To check for open paper or oil-filled capacitors, replace each temporarily with a good one.

Care should be taken in working on any inverter with the power on since, in effect, you are working across the power line.

In general, the service work required on inverters is quite small compared to the amount of trouble-shooting expected for a TV receiver during its normal life. Many service technicians in areas using d.c. power stock some replacement vibrators for the most frequently used inverters, but aside from that, no other special spare parts are usually stocked.

When the customer buys a TV set and wants it installed in a d.c. locality, it is up to the service technician to recommend a suitable inverter. The two major considerations are the d.c.

input voltage and the power output required. Typical inverter models which can be used for the different input voltage conditions are as follows: For 6-volt input, the Carter Model A1013CT or the ATR 6THSH may be used. Carter Models B1013CT to B1030CT or ATR Model 12THSH may be used for 12-volt d.c. inputs. Twenty-eight volt inputs can take the Carter J1013CT or the ATR 28THSH; for 32 volts, the ATR 32THSH is applicable. For d.c. inputs in the neighborhood of 110 to 117 volts, there are the Carter D1013CT, the ATR 110TRSE, and the Cornell-Dubilier 110RT15. Other models by these manufacturers are also available for this input voltage range.

Carter, Cornell-Dubilier, and ATR all make various models providing from 150 to 400 watts for continuous operation. It is important to select the right power rating since, if the power consumption is less than rated, the frequency often will be off and the voltage excessive. Some of the inverter manufacturers list both intermittent and continuous power output, but for a TV installation only the latter figure, the lower one, is important. The customer will operate his TV set for hours without switching it off, therefore, the intermittent power rating of the inverter has little meaning.

Ascertain the power requirement of the TV set by checking the manufacturer's label or tag which is usually found at the rear of the receiver. Select a suitable inverter by matching the TV power rating with the inverter rating as near as possible. For example, if the TV receiver requires 300 watts and the two nearest inverter models are capable of 250 and 350 watts respectively, the latter should be chosen. If we select the 250-watt model, the 300-watt TV set will operate at low line voltage and the inverter will tend to overheat. The 350-watt inverter will run cooler, and although it will supply a slightly higher line voltage than 117 volts a.c., it will otherwise operate correctly. If we should choose a 400-watt inverter for the 300-watt TV set, the inverter load would be much too light and unstable operation might result. Of course, it is always possible to connect a light bulb of suitable wattage in parallel with the TV set to load down the inverter.

Aside from the ordinary installation problems which beset the service technician, a d.c. TV installation can also suffer from any one or all of the following:

1. vertical rolling
2. dark bar moving in picture
3. interference.

To avoid these three defects, it is a good idea to test the receiver first in the shop. If 117 volts a.c. is available, connect the set to the line and carefully adjust the vertical height, linearity, and hold controls. Next, allow the picture to roll slowly vertically and look for a dark stationary bar on the screen. Turn the contrast down and



Fig. 4. Vibrator-type inverter with variable frequency control and automatic "on-off" switch which goes on with the set.

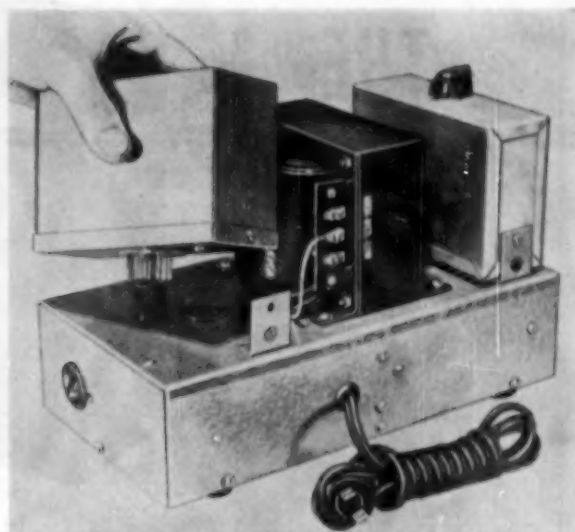


Fig. 5. Interior view of the vibrator-type inverter shown in Fig. 4. The automatic "on-off" switch is being plugged in.

the brightness up to see any such bar. This defect, if present, can be either a dark bar in the center of the screen, indicating 120 cps hum, or the upper half of the picture may be darker than the lower or vice versa, indicating 60 cps hum. The latter defect is most likely due to heater-to-cathode leakage in either the video or i.f. amplifier stages. Try replacing tubes to cure this.

The 120 cps or 60 cps hum interference may be very slight and may not be apparent when the set operates from the a.c. line which is synchronized to the TV station signal. When the picture is allowed to roll slowly up or down, this defect becomes apparent, just as it would appear when the set is operated from an inverter which is not locked exactly to the 60 cps frequency from the TV station. To cure a 120 cps hum condition may require additional filtering in the "B+" supply, and replacement or addition of some of the decoupling or filter capacitors.

The third type of installation trouble, interference due to the inverter itself, can be checked at the shop by operating the set first from the a.c. line and then from the inverter, if a suitable d.c. source is available. If such a source is not available in the shop, be sure to take some a.c. line and antenna filters along on the job.

Most of the inverters designed and sold for TV receiver work are well shielded and have good filters at the a.c. and d.c. terminals to keep any r.f. interference from the TV set. Occasionally, however, this filtering is not sufficient. The following general rules will help overcome r.f. interference due to the inverter and should be tried in sequence. When interference-free reception is achieved, the remaining steps can be omitted.

1. Locate the inverter at least 6 to 10 feet from the TV set. The inverter, especially if it has a "phantom switch" circuit, can be placed in a closet or an

adjoining room, or even in the basement. This reduces the susceptibility of the TV set to direct radiation from the inverter.

2. Install the antenna lead-in line away from the inverter or the a.c. and d.c. power lines.

3. Short out the antenna terminals at the receiver to see if interference persists. If it does, it is mostly due to the a.c. line or direct pick-up. If the interference disappears install an antenna interference filter directly at the TV receiver. High pass TV filters are standard items in electronics parts stores.

4. Install a line filter. Typical plug-in types suitable are the *Aerovox* Model IN30, *Mallory* Model X3, and many others. The line filter is plugged into the a.c. output of the inverter and then the line to the TV set is plugged into the filter.

5. If a line filter reduces the interference but does not eliminate it, add an antenna high-pass filter.

6. Severe interference may require a heavy-duty a.c. line filter right at the TV set. The *Mallory* Model LC5 has its own line cord which can be plugged in at the inverter and then the coiled up TV set power cord is plugged into the filter. A still stronger filtering scheme is to wire a *Sprague* "Filterol 2" into each side of the line cord right inside the TV chassis, with the filter ground connected to the chassis.

7. If it is impractical to locate the inverter at a distance, and interference is caused by direct radiation, the interior of the TV cabinet may have to be lined with copper screening. In lighter interference cases, a bottom plate on the chassis may be sufficient. This is not feasible in most of the new vertical chassis TV sets.

Most d.c. installations will not require any of these extreme measures. After completing the d.c. installation, it might be wise to check back in the evening when the line voltage is usual-

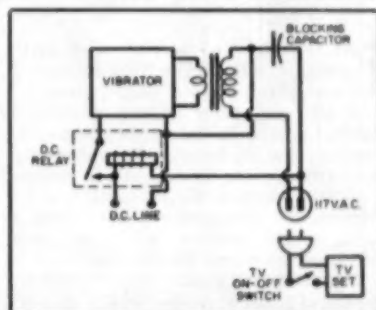


Fig. 6. Partial schematic diagram of the automatic "on-off" switch used in the vibrator-type inverter of Fig. 5.

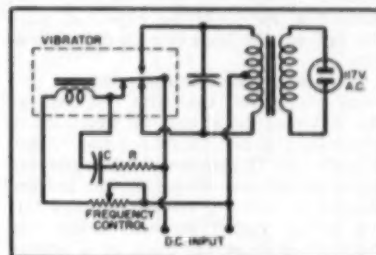


Fig. 7. Partial schematic diagram of the vibrator section of the inverter of Fig. 5. Note the frequency control.

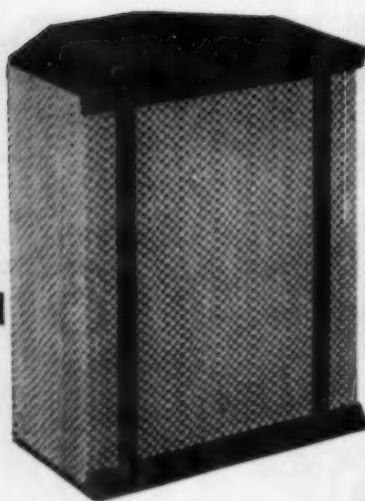
ly lower to see if the vibrator frequency adjustment needs touching up.

Some of the inverters feature a special frequency control for two reasons. Sometimes, in an installation using an inverter, a slight 60 cps or 120 cps hum will exist if the 60 cps power from the inverter varies with time. Also, this variation may lead to vertical instability which simple adjustment of the vertical hold control may not remedy. To correct these effects, the inverter frequency control is adjusted until the inverter output is close enough to the 60 cps sync pulses to allow good vertical locking action. -30-

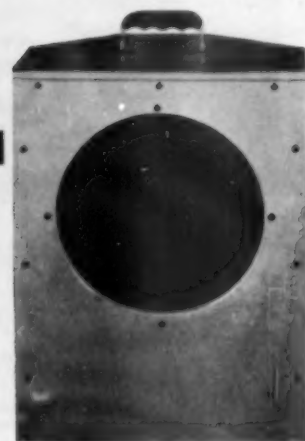
THE "REBEL 5"

By
JAY CARVER
Cabinart

Construction data on a compact, portable speaker cabinet which is designed to be used with a 12-inch loudspeaker.



Two models of the "Rebel 5," the one in fine woods (left) and the "utility" model (below) with a carrying handle for portability.



THE smallest of recent "Cabinart" developments in the field of corner horns is the 20-inch high "Rebel 5." The size and price of this particular cabinet might be misleading since, in reality, this enclosure offers excellent performance for so compact a design.

While crowded, the "Rebel 5" will accommodate a separate 3-way speaker with a 12" woofer with crossover points at 1000 and 5000 cycles.

Obviously the great, powerful boomy bass and tonal response which characterizes a "Klipschorn" are not available in this enclosure. Instead, this design gives a response which is as smooth for its size and as free from distortion as could be expected with the necessarily high crossover frequencies.

Naturally, the minimization of distortion requires that the response at the extreme bass end be attenuated. Therefore, if one compares the "Rebel 5" with the "Klipschorn" when playing organ music, one finds that the bottom couple of octaves are attenuated but the sound output remains clean. Its "controlled bass," or lack of a boomy peak of response, does not permit the diaphragm of the speaker or speakers to "free wheel," generating its own frequencies and cross modulating with the signal. Surprisingly, on lighter music of the piano (and especially if the repertoire avoids the lower octave) one has to listen closely to detect the difference between the "Rebel 5" and the "Klipschorn." Of course, it is assumed that the "Rebel 5" in this instance is driven by a 12" bass cone with a heavy magnet, a horn-loaded mid-range unit, and an extended-range tweeter.

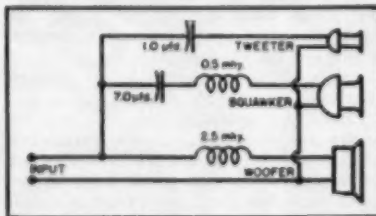
The choice of drivers for the "Rebel 5" can be determined by applying the following criteria: In the \$40-\$60 price range, the best choice would be two-way coaxials incorporating horn-type

tweeters. The single voice coil speaker is not advisable with this design because of the distortion and lack of definition which may result. Drive systems in the \$80-\$120 class may be built up from a 12" cone woofer, a mid-range driver of the "ball park" type on a short horn, a tweeter, and a crossover network. In the case of woofers, high-efficiency units with light magnets should be avoided.

Assuming use of mid-range and tweeter systems, the squawker or mid-range unit as applied to the "Rebel," is required to cover slightly more than two octaves. Preferred are the public address type, compression units using a 2" diameter phenolic diaphragm. The tweeter must be of the type which is free from peaks in the 5000 to 10,000 cps region or an unnatural "presence" peak will exist. Preferable is a diaphragm not larger than $\frac{1}{4}$ " of the phenolic type to produce the internal damping of transverse waves within the diaphragm and a horn not to exceed 3" in length with an adequately small throat for proper loading.

A crossover network for a multiple system in the "Rebel 5" should be one

Suggested crossover network for three-way "Rebels." Constants given are for a 16 ohm voice coil with 1000 and 5000 cycle crossover frequencies. Since this network is a special design, it would have to be made up of individual components. The inductors used are of the variable type, similar to the UTC VI-C13 and VI-C10.



having a 6 db/octave slope instead of the type having a sharp cut-off. When using separate, 3-way drive systems in this enclosure it is possible to achieve the same response and freedom from distortion above 1000 cycles as are available in the "Klipschorn" in the same frequency range. This means that the reduction in size and cost has resulted in a sacrifice in tonal response only in the region below 1000 cps.

With performance such as this, the enclosure is suitable to recording monitoring applications, for use with portable motion picture projection units, and in home sound systems where space is at a premium.

The "Rebel 5" is the third of a series of "Rebel" cabinets put out by G & H Wood Products Company, 75 North 11th Street, Brooklyn 11, N. Y. in its "Cabinart" line.

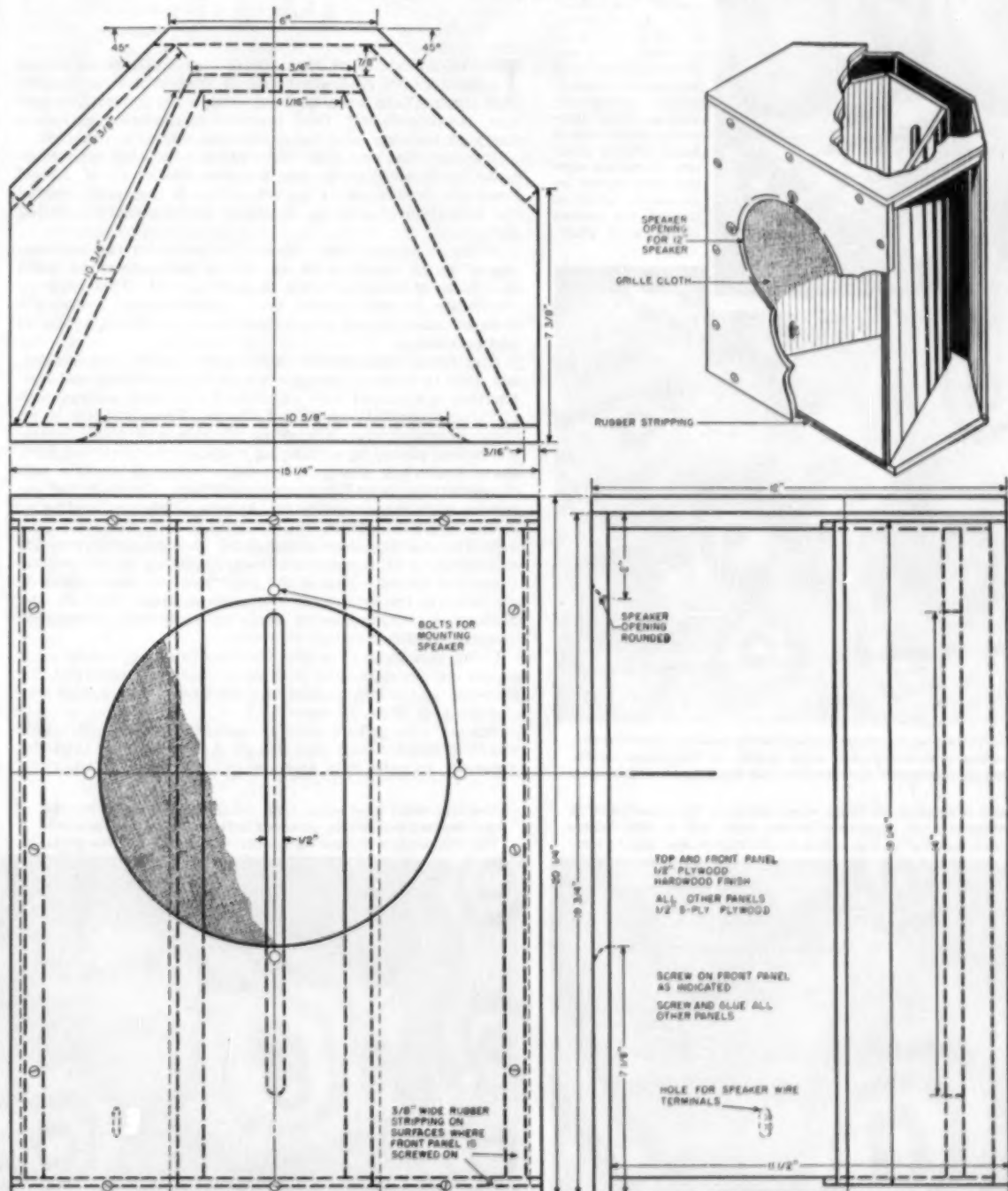
The first, the "Rebel 3" was the largest unit and was designed especially for 15" speakers. The "Rebel 4" was offered in both 12" and 15" versions, the former being described in the October 1953 issue of RADIO & TELEVISION NEWS.

This "Rebel 5" is actually the smallest of the group and was designed primarily for use where space is an important factor and portability is desired. It has one added feature in that although best performance is obtained when used in a corner, it does incorporate its own corner horn making it possible to use it against a flat wall. The other two versions did not include this feature.

The "utility" version of the "Rebel 5" is priced less than \$35.00, cut for 8" or 12" speakers and under \$50.00 for the versions in fine woods and leatherette. All required cutouts for the loudspeakers to be used are included in the net prices. Both the portable and fine-wood models are shown in photos above.

Mechanical Details on the "Rebel 5" 12" Speaker Cabinet

Additional notes on the construction: This enclosure is designed for use with any three combinations of speakers: 1. A single 12" coaxial speaker incorporating a woofer and tweeter. 2. The coaxial unit of (1) with the addition of a separate high-frequency horn. The tweeter of the coaxial unit would then serve as a mid-range unit. 3. Individual units consisting of a woofer, squawker (mid-range) and tweeter. Note that the additional cut-outs for the mid-range and tweeter units are not shown in the mechanical details below. Obviously, the size of the cut-outs would depend on the particular units used. They can, however, be added to this enclosure. To do so, simply invert the cabinet or the mounting board so that the woofer unit is at the bottom of the enclosure. Add the other units above the woofer and assemble them directly to the mounting board.

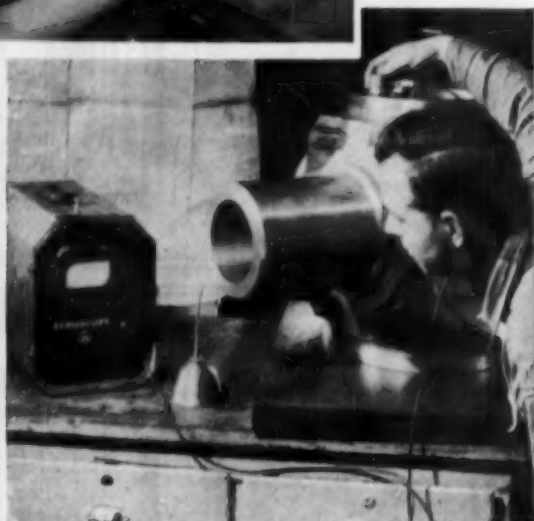


THE SCIENCE OF

Curtiss-Wright has introduced a whole series of devices covering applications from quality control to dentistry.

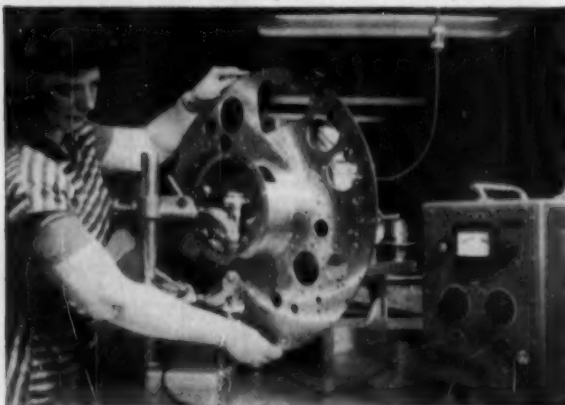


Various shapes may be cut in ceramics, metals, or glass by means of the ultrasonic drill which bores without rotating. A rapidly moving head drives an abrasive solution through the surface of the work piece.



A large hub is examined ultrasonically with an "Echoscope." Location of flaws, if they exist, shows on the scope screen. Transducer-receiver operates on the impulse-echo principle.

Rapid inspection of large metal parts is facilitated with a "Sonometer," an ultrasonic "seeing eye" that locates defects in materials without resorting to destructive test procedures.



THOSE sound waves that travel in the ultrasonic region (above 20,000 cps) are being utilized in a wide variety of applications ranging from equipment for quality control, manufacturing, food processing, medicine and dentistry to brewing, and industrial and scientific research.

The fact that an ultrasonic wave has the ability to penetrate thick metal pieces and traverse the length of a steel beam yet is stopped by an air pocket is the secret behind the operation of a whole series of non-destructive testing devices.

In other applications, ultrasonics relies on the harnessing of large numbers of vibrations per second to move molecules of which all matter is composed. This explains its ability to mix liquids, for example, more thoroughly than by any normal mechanical means such as agitation and paddles.

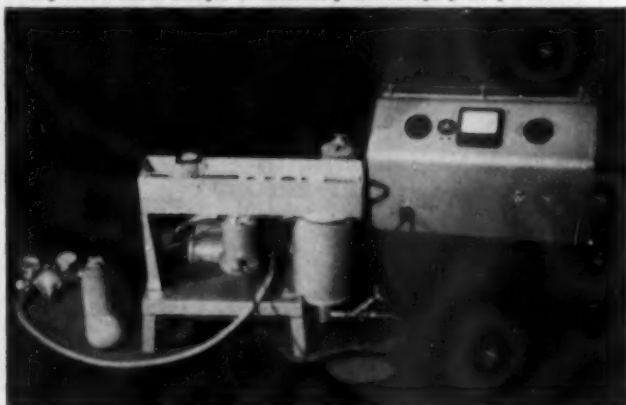
Electronic instruments, similar to radio transmitters, are used to make ultrasonic waves by expanding and contracting a material able to convert electrical energy into ultrasonic oscillations or pulsations. These materials include magnetic metals, certain crystals, and some ceramics. When placed in a changing magnetic or electrical field, these materials change physical shape. In metals this characteristic is called magnetostriction. Crystals and ceramics with this property are known as electrostrictive or piezoelectric materials.

In the rapidly alternating field, the material expands and contracts at frequencies from 20,000 up to 500 million times per second. This is the source of the waves that do the work in the science of ultrasonics. From there on, the problem is simply one of applying a suitable soundhead directly to the material in work.

Using this basic principle, *Curtiss-Wright Corporation* is producing an extensive line of ultrasonic equipment for industry and science under license from *Dr. Lehfeldt and Company* of West Germany.

Among the unique devices now ready are ultrasonic washing units which are designed for cleaning and degreasing delicate foils and small and large metals parts

Delicate foils, tiny gears, and other metal objects can be quickly and thoroughly cleansed in the ultrasonic parts washing unit without danger of deforming or damaging the parts.



ULTRASONICS

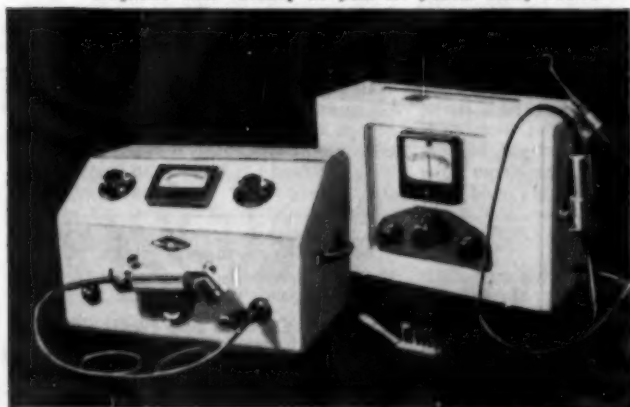
which could easily be damaged by mechanical or chemical cleansing processes; a "Sonometer" which locates defects in materials however close to the surface. This device incorporates a sonic transmitting head which sends a beam directly through the entire test object to a separate receiver; an ultrasonic drill that is capable of cutting intricately shaped holes in metals and ceramics in a single operation; and an ultrasonic echo device which detects flaws in metal, measures the thickness of materials, and computes fluid content.

In the medical, laboratory, and food processing fields the company has demonstrated an ultrasonic therapy device which is especially valuable in the treatment of osteo-hypertrophic and degenerative arthritis, bursitis, neuritis, sciatica, myalgia, fibrositis, sprains and strains, and forms of chronic superficial ulcers; a unit that painlessly anesthetizes teeth without injections which has proven advantageous in preparing painful cavities, quick iontophoresis, pain therapy, preparation of vital pulps, pulp test and high-frequency minor surgery; in the laboratory and food processing realms the ultrasonic "Conche" is designed to provide rapid homogenization of chocolate; while an ultrasonic hops extractor that improves the flavor and quality of beer at the same time cutting production costs is also being offered.

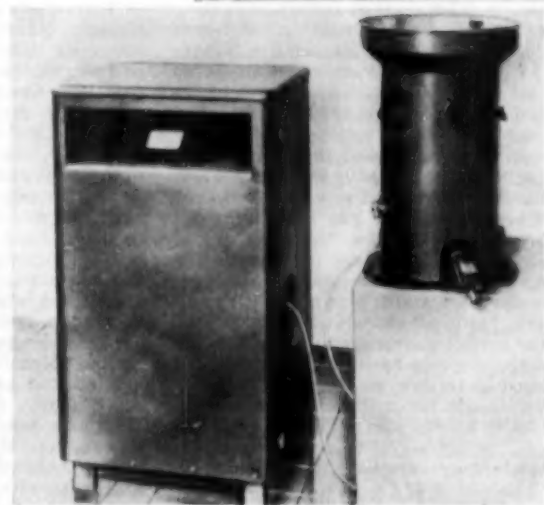
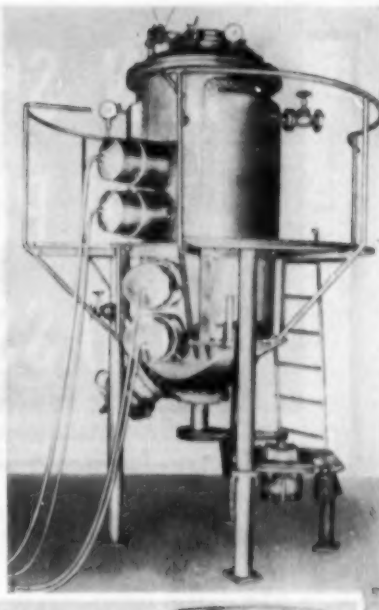
In the medical field one of the primary advantages, according to the company, is that no extensive training is required of the technician who administers the treatment. Since these therapy units are available in both portable and office models they provide a flexible tool for the physician. They are designed to be used in two different ways, one the direct method whereby the skin is well oiled and the transducer slowly moved over the area, and the indirect method involving the submersion of the part to be treated in water and then placing the transducer about one-half to one inch away from the affected part. The treatments are designed to be administered in a series of eight to twelve treatments at intervals of 48 hours with each treatment averaging from 3 to 10 minutes.

All of these devices offer unique advantages to the industrialist, the doctor or dentist, and the laboratory technician in that ultrasonics provides a rapid, precise, and thorough method of handling the job at hand. The advantages of ultrasonic techniques in industry are many in that it saves both time and materials.

An ultrasonic therapy unit (left) and the "Dentatron" unit (right)—both designed to facilitate medical treatment and diagnosis with virtually no pain for patient being treated.

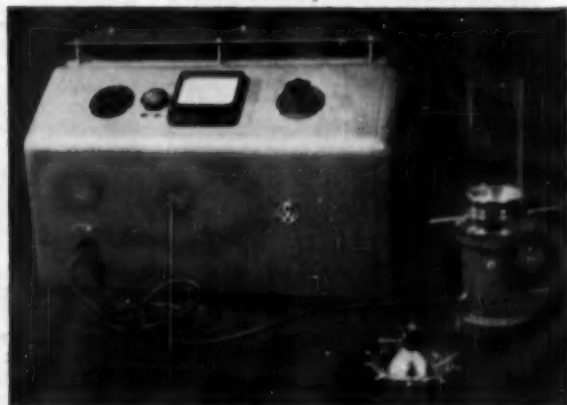


Ultrasonic hops extractor used to improve flavor of the beer and reduce amount of hops needed by nearly 50 percent in extraction and separation of aromatic and bitter substances. Process also improves shelf stability and retards sedimentation.



The "Conche" ultrasonically homogenizes chocolate masses in a matter of seconds. The process improves flavor, makes the chocolate easier to work, saves time, waste, and floor space.

One of the ultrasonic laboratory units for research and small production in the fields of bacteriology, chemistry, nutrition, etc. There are various accessory units available for unit.



WHEN SHOULD YOU PULL A CHASSIS ?



The type of servicing in the home shown by this illustration is definitely not recommended. It is inefficient, degrading, and can result in damage to furniture and rug.



WITH the multitude of different troubles that may befall a TV receiver, the ailment cures range up and down the scale from the ridiculously easy to the incredibly difficult. The easy repairs can be dispatched neatly and inexpensively in the home, while the real toughies have to be taken into the shop for costly bench scrutiny. Where should the line be drawn? At what point on the "difficulty scale" should you cease all home attempts and pull the chassis into the shop?

These questions pose a ticklish problem, for in all fairness to yourself and the service business you are connected with, the cold facts of profit and loss must be considered. On the other hand, you must honor the trust the technically uninformed set owner places in you, by not permitting him to pay exorbitant or unnecessary charges.

Picture Tubes

Our service company advocates pulling almost all picture tube jobs. This is a safe procedure since it eliminates implosion dangers. However, there is another important factor. A very human TV service technician will occasionally err in his analysis of what is wrong, but if the chassis is perched on the bench, the blunder is of little consequence.

For example, one of our technicians was called out to repair a 21-inch *Philco*. It had no brightness. A cold 6AX4 damper tube was quickly located and the picture blossomed in. Then he checked the rest of the set. He found the brightness control fixed at a fairly high level. No amount of turning the "pot" would alter the setting.

He informed the customer of the condition. The set owner told him that the brightness control had never worked; she thought it was supposed to be that way. The service technician explained she had a shorted electron gun in her picture tube. All was well

though, for the receiver was only about six months old. The technician sold her on the idea of exchanging the defective warrantied CRT. He then pulled the chassis into the shop and sent the CRT to *Philco* for exchange. However, the distributor surprised everyone by refusing the exchange. After checking the tube they came up with the amazing statement that the tube was good.

The technician tried a different tube in the chassis. It, too, reacted with the same fixed brightness condition. A bit of frantic ohmmeter checking found the cathode connection of the CRT at ground potential. This was dead shorting out the brightness "pot." Thereupon it was discovered that a wire stretching across the brightness control to the CRT cathode was wedged tightly beneath a selenium rectifier. The pressure had damaged the insulation of the wire. By fixing the bad wire the brightness control was restored. Luckily, the service technician had pulled the chassis. What would have happened if he had tried to install a new picture tube in the home?

Another time, one of the boys was out looking at a 12-inch *Du Mont*. It also exhibited the classic fixed brightness symptoms. He sold the customer on the idea of a new picture tube, then he pulled the chassis. On the bench, the condition turned out to be a little different. Upon turning the "pot," the brilliance would vary a slight bit. A .05 μ f. capacitor leading from the video amplifier into the CRT grid was shorted, putting "B+" on the grid. This caused the defective CRT symptoms.

On occasion, though, the customer puts a fly in the ointment. He decides that the CRT changing must take place in the home. Although disagreeable, from an objective business point of view it is not good to lose the sale. We've changed lots of CRT's in the

home under these circumstances. One of our technicians was looking at a 12-inch *Emerson* that had no raster but plenty of high voltage. The heater of the picture tube was lit. The high voltage lead was found to spit purple death nicely to the chassis, but would not spark at all into the picture tube well. An open CRT cathode was suspected, although there was the lesser possibility of an open resistor in the CRT circuit. The rugged individualistic set owner had his own ideas on the subject. He insisted on the picture tube replacement taking place in his domain. Rather than lose the sale, the technician agreed. He took a deposit and left.

The following day he returned with a new picture tube and fortunately the installation confirmed his suspicions. Everybody concerned was happy. The service technician collected the money and breathed a sigh of relief. He didn't have to use the alternate explanation he had prepared or any of the bevy of resistors he was carrying for the occasion.

Upon customer demand, we will go ahead with an occasional parlor floor CRT changing, but we do not as a rule think it is the wisest method. The job can be handled in a much safer and more expert fashion on the shop bench.

In order to install a new CRT in the home you must make an extra trip to obtain the tube anyway. Instead of leaving with a deposit and coming back with a boxed CRT, you can leave with the chassis and come back with a working receiver. Then you can install the set with a comfortable feeling, knowing everything is right, rather than with a half formed prayer that everything will go as hoped.

Obvious Bad Parts

What about other repairs? When should home service investigations stop and the chassis be pulled?



The only sure way to troubleshoot a receiver quickly and expertly is on the shop bench with test equipment and schematic diagrams.

Every service shop should have a definite understanding on this—here are a few recommendations for better customer relations.

By ART MARGOLIS

Allowing for exceptions, our company decided that we should change in the home any part that is definitely proven bad. This includes tubes, fuses, capacitors, resistors, selenium rectifiers, etc. On one house call involving a 12-inch *Admiral*, the symptoms were poor sync and a moving weave. Checking through the tuner, i.f., video, and sync tubes showed nothing. The chassis was taken out of the cabinet and the technician poked around beneath the sync tubes with an ohmmeter. There, coming off the 12AU7 sync separator plate, was a .02 μ f. capacitor that measured three ohms. (See Fig. 1.) The solder gun unhooked it and a new capacitor was quickly installed. The picture locked in.

The only thing is, you must be very careful with these obvious troubles. On one job in a customer's home, a 21-inch *Philco* displayed a small square gleam of illumination that wouldn't have been enough to grace a scope tube. Without hesitation, the bright orange rectifiers were replaced with a pair of sky blue ones. Sure enough, it spread the picture out, but not enough. Also, the sides of the picture now had a 120-cycle ripple. Without further ado, the chassis was pulled.

In the shop, it was discovered that one of the 120 μ f. filter capacitors had decided it didn't want to be a capacitor any more and had transformed itself into a big fat 40 megohm resistor. A new capacitor was all that was needed to complete the repair.

Other times you will easily spot an obviously bad part, but it is not sensible to change it in the home. Such troubles as faulty tube sockets and bad flyback transformers fall into this category.

A 21-inch *Muntz* that was checked in the home had snow on all channels. When a voltmeter probe was placed on the 6BZ7 r.f. amplifier plate connection, "B+" was missing. The chassis was pulled and, in the shop, an open 1500 ohm plate load resistor was located in the tuner. In this case, it would definitely have been a messy job to change the resistor in the home.

If you do not know the exact part that is causing the trouble in a TV set, without really digging, the repair job should not be accepted unless you can pull the chassis into the shop. Extensive troubleshooting on a set owner's living room floor or rug cannot be done satisfactorily or profitably.

Before adopting this rule, one of our boys was out looking at a 16-inch *Admiral*. He found that there was no raster or high voltage; however he discovered a unique phenomenon. If he pulled out any of the video i.f., detector, or video amplifier tubes, both the high voltage and raster would sing on.

He pulled the chassis out onto the floor, opened up a service schematic manual, and began checking voltages. After about an hour and a half of squirming and sweating, he rooted out an open 100,000 ohm resistor. (See Fig. 2.) It was one of the twin balancing resistors across the 6AL5 horizontal phase detector. Being open, an unbalanced sync pulse was fed to the horizontal oscillator grid, 180 degrees out-of-phase with the sync signal. This positive voltage killed the oscillator which, in turn, could produce no high voltage. If the technician extracted any of the video tubes there would be no sync. The 6AL5 did nothing and permitted the oscillator simply to run free.

Before the chassis was re-installed and all details taken care of, better than two hours had elapsed. The set owner called a few hours later, at the same time the technician was telling us how he licked this dog. She told us loudly, "You people have a heck of a nerve sending out that inexperienced man. I had to pay for over two hours labor just for a little resistor. And he never would have found it then if he hadn't looked in his book!"

Another time, one of our men was in a home working on a 12-inch *Philco*. The video was extremely strong even at minimum setting of the contrast control. The too dark picture was intermittently breaking into sync and weaving. New tubes didn't help at all. The chassis was pulled out of the cab-

inet and turned on its side. All voltages seemed right except the bias on the i.f. tubes. They were a bit too positive. Some parts were unsoldered, their resistances were checked, and then resoldered. The technician was completely stumped.

Finally, he told the customer that the chassis must go. She snapped back, "Sure, first you throw my television around on the floor, then burn up all the parts underneath. No wonder you have to take it to the factory. You broke it and don't know how to fix it!"

After a couple of hours on the bench with the little monster, the technician had to admit that maybe he didn't know how to fix it. Then he consulted his *Philco* service notes. By the greatest stroke of fortune they told about this model and this special condition.

(Continued on page 131)

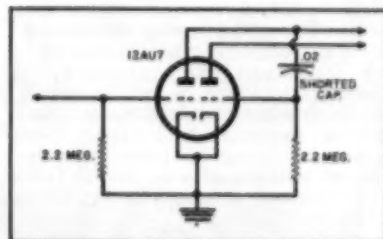
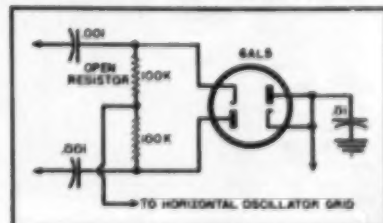
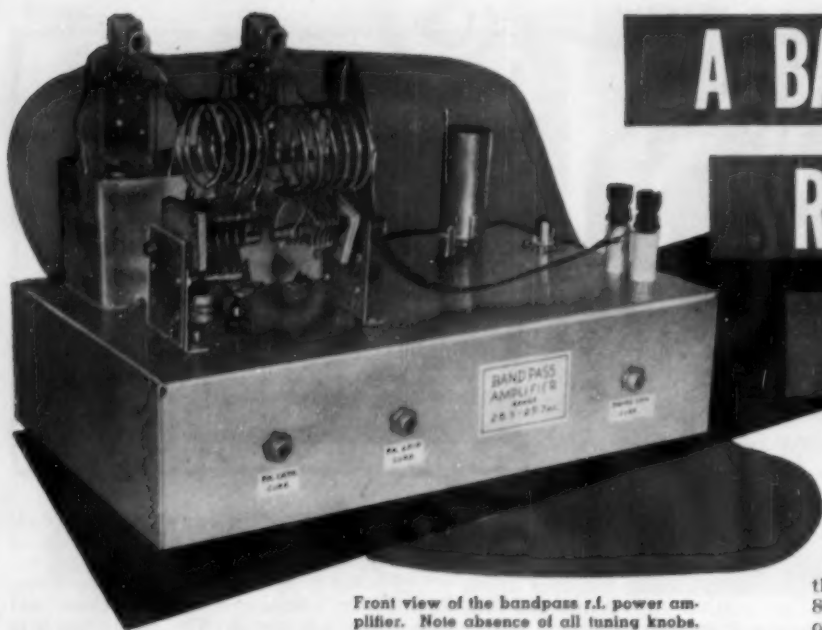


Fig. 1. The .02 μ f. capacitor coming off the 12AU7 sync separator plate measured three ohms in this circuit, resulting in poor sync. Such a condition can be detected and repaired on a house call.

Fig. 2. Lack of high voltage was traced to an open 100,000 ohm resistor in this horizontal phase detector circuit.





Front view of the bandpass r.f. power amplifier. Note absence of all tuning knobs.

A BANDPASS R.F. POWER AMPLIFIER

By
RICHARD GRAHAM, W2PDI

Details on a unique unit which permits operation over an entire amateur band without need for tuning adjustments.

A BANDPASS amplifier—what's special about it? Nothing that hasn't been commercially exploited, but something most hams have been missing out on. Many a ham's ideal is a transmitter that will stay tuned up over the entire band. Toward this end, a number of good articles have appeared featuring a broadband or gang-tuned transmitter. A few have used a double-tuned stage in the exciter. But virtually all have required some sort of power amplifier tuning adjustments. Well, this amplifier provides an answer for these particular gentlemen for there are no knobs to turn or adjustments to make (other than the v.f.o.) over an entire amateur band. There is no grid tuning, no power amplifier tuning, or antenna peaking.

The method of accomplishing this is quite straightforward and a detailed explanation can be found in any radio

engineering handbook. However, briefly, when two tuned circuits are coupled together a flat-topped type of response curve can be obtained by careful adjustment of the resonant frequencies of the tuned circuits, the coupling between the tuned circuits, and the effective loading across the secondary tuned circuit. The application of these bandpass or double-tuned circuits is quite common in TV set i.f. strips (at least the older models) and many television transmitter power stages.

This amplifier isn't intended to be the answer to every operator's prayer for it has a few minor drawbacks which will be explained. First, it admittedly is more difficult to tune up, but once it is adjusted it's done for once and for all—just like a TV set i.f. strip. Secondly, it can only be used with a broadband antenna such as a folded dipole. The third item is that

the amplifier efficiency drops to about 80 per-cent of its efficiency as an ordinary narrow-band amplifier. In return you get the powerful advantage of convenience in operating and the ability to change frequencies as fast as you can turn the knob of the v.f.o.

The particular amplifier described and shown schematically in Fig. 3 is designed for the ten-meter phone band—this being the writer's particular favorite. However any band of the builder's choice can be used by changing the coils and tuning capacitors to resonate in the desired band. The principles and tuning up procedure are still the same.

Double tuning the output stage of the transmitter, when properly adjusted, permits a constant power output to be developed over the entire band of frequencies from 28.5 to 29.7 megacycles. Broadbanding the usual single-tuned transmitter output circuit by means of lowering the tank circuit capacitance or increasing the load would result in very low efficiency since the load resistance that the tube sees drops as the bandwidth increases. For example, the load resistance that the tube sees for a practical amplifier would be given by the following equation.

$$R_L = 1 / (2\pi\Delta f C) \dots \dots \dots (1)$$

Where:

Δf = bandwidth between half power points

C = tank circuit capacitance

C is on the order of 30 μfd . This value is dictated by the output capacity of the tube or tubes. The bandwidth Δf would have to be quite wide if the response curve and hence the power output is to remain fairly constant over the band. With a single-tuned circuit the response can never be made flat and therefore the power out can never actually remain constant. However letting the bandwidth equal 5 megacycles and substituting in equation (1) will give us a typical value of load resistance.

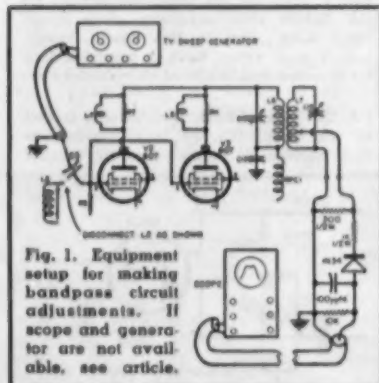


Fig. 1. Equipment setup for making bandpass circuit adjustments. If scope and generator are not available, see article.

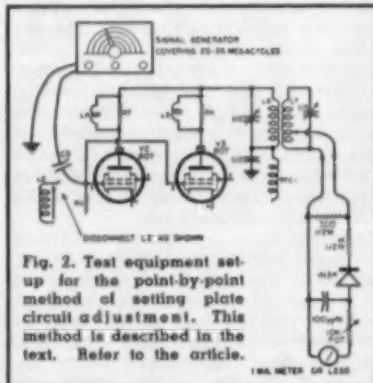


Fig. 2. Test equipment setup for the point-by-point method of setting plate circuit adjustment. This method is described in the text. Refer to the article.

$$R_L = \frac{1}{(6.28)(5)(10^6)(30 \times 10^{-12})} = 800 \text{ ohms}$$

The "Q" of such a circuit would be quite low as shown by substituting in the following:

$$Q = R_L/X_C = 800/177 = 4.5 \quad (2)$$

Such a low tank circuit "Q" means high harmonic output with consequent TVI problems. This is in addition to the very low efficiency to be expected with the tube working into an 800 ohm load. Thus broadbanding in this manner is quite impractical.

However by double tuning the output the low "Q" and low efficiency can be improved tremendously. The bandpass characteristic of a double-tuned transitionally-coupled circuit, i.e., a double-tuned circuit adjusted to produce maximal flatness on the top of the bandpass curve, is illustrated in Fig. 4. The characteristic curve of a broadbanded single-tuned circuit is also included for comparison.

The top of the curve in Fig. 4 is flat which means a constant power output. The sides are steeper than the single-tuned broadbanded circuit shown which infers a higher load resistance for the tube. This is more rigorously shown by the following. The load resistance R_L in this equation is that seen by the tube working into a transitionally-coupled, double-tuned circuit.

$$R_L = 1/(\sqrt{2\pi\Delta f C}) \quad (3)$$

where:

Δf = Bandwidth between half-power points

C = Primary tank circuit capacity.

Since the sides of the curve for the double-tuned circuit are steep, the bandwidth Δf can be conservatively given as 3.5 megacycles if only 1.2 megacycles are desired flat. Substituting in equation (3):

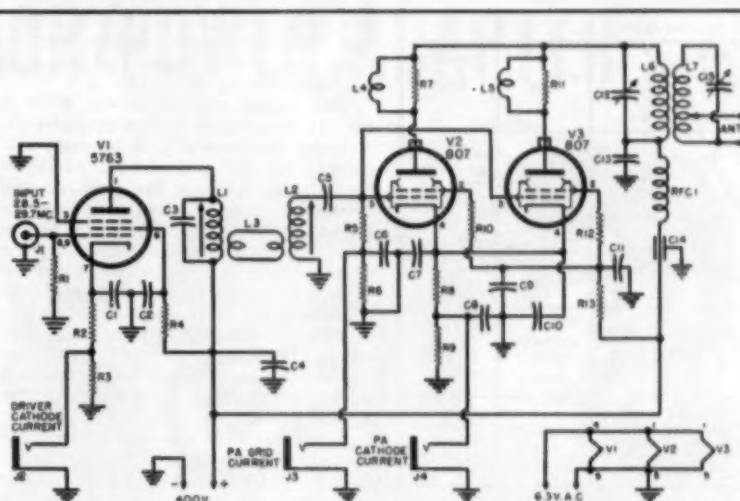
$$R_L = \frac{1}{(1.44)(3.14)(3.5)(10^6)(30)(10^{-12})} = 2140 \text{ ohms}$$

The "Q" of the primary circuit is now up to 12. This value is within the usual design values of 10 to 20 for amplifier tank circuit "Q". At the same time the load that the tube sees is increased 2.7 times over the previous case of a broadbanded single-tuned circuit. This means that for the same plate current flowing through the tube, 2.7 times the power can be developed.

Now finally, let's compare this double-tuned circuit to the usual narrow-band single-tuned circuits used in most transmitters. Let's assume a middle value of "Q" of 15. At an operating frequency of 30 megacycles, the bandwidth of such a circuit is 30/15 or 2 megacycles. Substituting in equation (1); R_L would then equal:

$$R_L = \frac{1}{(2)(3.14)(2)(10^6)(30)(10^{-12})} = 2650 \text{ ohms}$$

In the double-tuned circuit, the load resistance was calculated to be 2140 ohms. Comparing this to the 2650 ohm



R_1 —15,000 ohm, $\frac{1}{2}$ w. res.
 R_2 —500 ohm, 2 w. res.
 R_3, R_4, R_5, R_6, R_7 —47 ohm, $\frac{1}{2}$ w. res.
 R_8 —27,000 ohm, 2 w. res.
 R_9 —6000 ohm, 1 w. res.
 R_{10} —47 ohm, 2 w. res.
 R_{11} —200 ohm, 5 w. wirewound res.
 R_{12} —10,000 ohm, 5 w. wirewound res.
 C_1, C_2, C_3, C_4 —0.05 μ fd. disc ceramic capacitor
 C_5 —22 μ fd. tubular ceramic capacitor
 $C_6, C_7, C_8, C_9, C_{10}$ —0.01 μ fd. ceramic stand-off capacitor
 C_{11} —100 μ fd. mica capacitor
 C_{12} —25 μ fd. var. capacitor
 C_{13} —1000 μ fd. ceramic capacitor

C_{14} —1000 μ fd. ceramic feedthrough capacitor
 C_{15} —33 μ fd. var. capacitor
 L_1 —10 t. #24 wire, $\frac{1}{8}$ " dia. slug-tuned form
 L_2 —6 t. #24 wire, $\frac{1}{8}$ " dia. slug-tuned form
 L_3 —Link consisting of 2 t. each on L_1 and L_2 .
 Use hook-up wire
 L_4, L_5 —8 t. hook-up wire wound over R_7 and R_{11}
 L_6 —3 t. #12 wire, $1\frac{1}{2}$ " dia. airwound
 L_7 —6 t. #12 wire, $1\frac{1}{2}$ " dia. airwound
 RFC_1 —R.f. choke, 21 phy., 600 ma. (Ohmite Z-28)
 J_1 —Coax connector
 J_2, J_3, J_4 —Open-circuit jack
 V_1, V_2 —807 tube
 V_3 —5763 tube

Fig. 3. Schematic diagram and parts list covering bandpass r.f. amplifier.

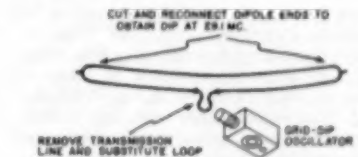
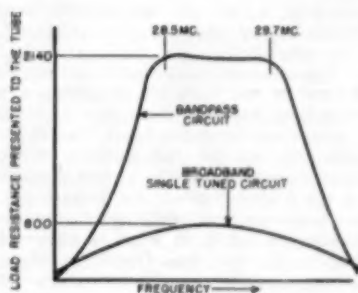
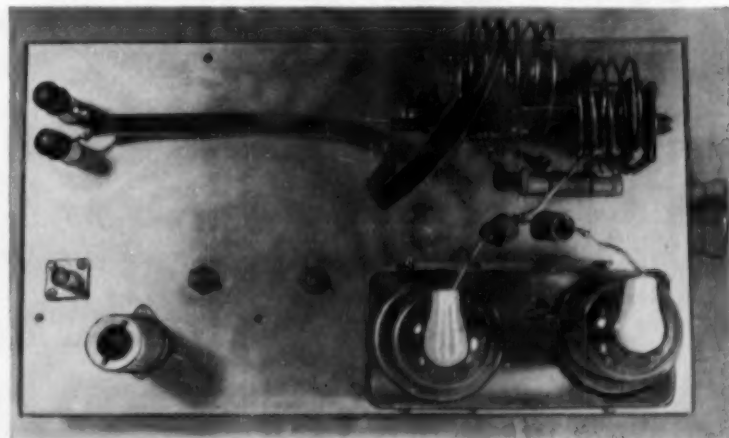


Fig. 5. Method of getting the antenna resonant to the center of the band. See text.

Fig. 4. Comparison of frequency versus load resistance for a single-tuned broadbanded circuit and double-tuned circuit.

Top view of the author's bandpass r.f. power amplifier. It is easy to build.




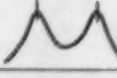
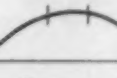
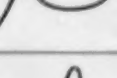
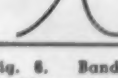
BANDPASS CHARACTERISTIC AS SEEN ON SCOPE	DEFECT	REMEDY
	NONE	NONE
	NOT ENOUGH LOADING ON SECONDARY	MOVE ANT. TAP ON L7 UP TO FALL VALLEY
	CIRCUIT TOO HEAVILY LOADED	MOVE ANT. TAP ON L7 DOWN TO REDUCE LOADING
	BANDWIDTH TOO WIDE	REDUCE COUPLING BETWEEN L6 AND L7
	BANDWIDTH TOO NARROW	INCREASE COUPLING BETWEEN L6 AND L7

Fig. 8. Bandpass characteristic of a double-tuned transitionally-coupled circuit under various operating conditions.

load which would normally be used means that the efficiency has dropped to about 80 per-cent of what we would normally expect. This means that for the same plate current we will get 20 per-cent less power out for the convenience of operating the amplifier in this manner.

Outside of the bandpass coupling networks in the grid and plate circuits of the 807's, the amplifier is quite conventional. A 5763 pentode serves as a driver for a pair of 807's operating in parallel. Drive for the 5763 was obtained from a v.f.o. exciter in this case, and was capacity-coupled through a piece of coax cable to the grid of the 5763. The coax in this case serves only as an additional capacitance across the tank circuit of the exciter. The output of the 5763 is fed through the bandpass coupling network into the grid of the 807's. The input bandpass circuit has a fixed load consisting of the grid leak resistance and the input resistance of the tube when it is being driven. With the load thus presented, the bandwidth

is approximately 4.5 megacycles wide. For this reason it is fairly easy to adjust the grid circuit. Even with this wide bandwidth plenty of drive is available for the 807 grids.

The output circuit of the 807's is similar electrically to the grid circuit, however mechanically it is quite different. In the grid circuit, variation in coupling between the primary and secondary tuned circuits is accomplished by varying the position of the link between the two circuits. In the plate circuit this variation is accomplished by orienting the position of the secondary coil with respect to the primary coil. Also, because of the lower power in the grid circuit it was convenient to use slug-tuned coil forms for tuning the primary and secondary. The higher power involved in the plate circuit necessitated the use of variable capacitors for tuning.

The output circuit also involves one more variable to be adjusted, i.e., the antenna loading. In the grid circuit the loading is fixed as stated previously. However in the output circuit efficiency and, consequently, bandwidth is quite important. Thus besides the primary and secondary tuning adjustments and the coupling adjustment, a careful loading adjustment is also necessary.

The load placed on the transmitter must be fairly constant over the whole band. A 300-ohm folded dipole has this characteristic. An ordinary 72-ohm dipole, beam, or other types of relatively low impedance antennas have too high a "Q," i.e., too narrow bandwidth to be used satisfactorily with this amplifier.

The antenna must also be cut for the center of the band to present a substantially resistive load to the transmitter over the entire band. This is best done by cutting the antenna longer than necessary for the center frequency (29.1 megacycles). By removing the transmission line from the antenna and making a one-turn loop as shown in Fig. 5, the resonant frequency of the antenna can be quickly determined. By pruning the ends, the exact frequency

of 29.1 megacycles can be reached. Unfortunately the dimension cannot reliably be given here because the propagation constant of 300-ohm ribbon varies considerably between different manufacturers. The best and most reliable method is the pruning method described.

The tuning up of the amplifier is done in two stages, first the grid circuit adjustments are completed, and then the plate circuit parameters are adjusted.

The first step in adjusting the grid circuit is to set the resonant frequency of L_1 and L_2 . First slide the link L_2 down toward the chassis to loosen the coupling between the primary and secondary. Now adjust the slugs in L_1 and L_2 to 29.1 megacycles with a grid dip meter. Now remove one end of the screen dropping resistor R_{12} so the 807's will not draw any appreciable plate current. Now turn on the plate voltage to the amplifier. Plug a 0-10 milliamper meter in the grid current jack and slide the link up toward the coils. Sweep over a range of approximately 28 to 30 megacycles with the exciter. Adjust the position of the link and touch up the adjustment of L_1 and L_2 to get a fairly constant grid current over the band from 28.5 to 29.7 megacycles. Some juggling of L_1 , L_2 , and the link position will be necessary since each adjustment interacts with the other adjustments.

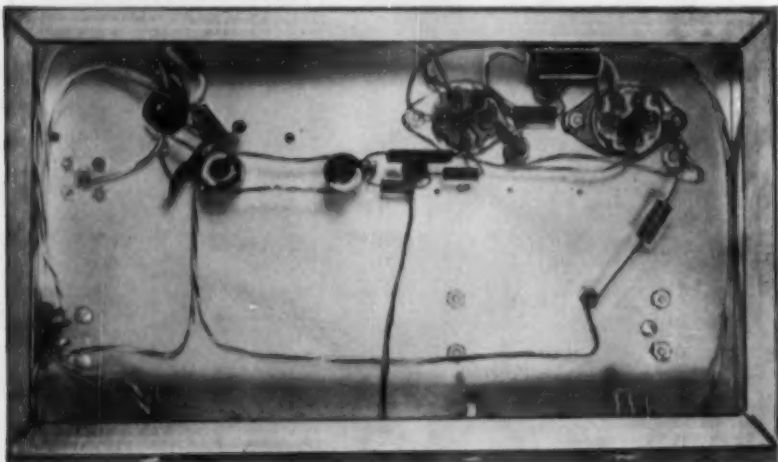
The next step is to adjust the plate circuit. A television sweep generator covering the 28-30 megacycle region and an oscilloscope are very helpful in adjusting the tuning, coupling, and loading adjustments, however they are not essential. A sweep generator and an oscilloscope can give an immediate picture of the condition of the tuning and speeds up the procedure considerably since the effect of any one adjustment can be visually observed on the scope. However since many of us don't have sweep generators and scopes available, an alternative method of tuning will also be discussed.

This latter method, which is not too difficult, uses the amplifiers v.f.o. or an ordinary signal generator that covers the 10-meter band.

The test equipment set up for the sweep generator method is shown in Fig. 1. The 300-ohm resistor simulates the 300-ohm folded dipole for the preliminary adjustments. Set the load tap on the second turn of the secondary coil L_2 . Loosen the coupling between the primary coil L_1 and the secondary coil L_2 by rotating the whole capacitor and coil assembly C_{12} and L_2 about the mounting bushing of C_{12} . Set the resonant frequencies of the primary and secondary circuits to 29.1 megacycles by adjusting C_{12} and C_{22} respectively. Now couple the coils approximately as shown in the photographs. Set the sweep generator to sweep through a range of about 25 to 35 megacycles. Adjust C_{12} and C_{22} , the coupling and load tap point to give a flat-topped bandpass of 28.5 to 29.7 megacycles. The adjustment of these four factors

(Continued on page 113)

Underchassis view of the bandpass r.f. power amplifier. Construction is simple.



DISTORTION/POWER ADAPTER

By ALLAN M. FERRES

HARMONIC distortion and power output can be measured with an a.c. vacuum-tube voltmeter, such as the Heathkit AV-2, by the addition of a simple, low-cost adapter. These measurements will aid the service technician and experimenter in his work with audio equipment.

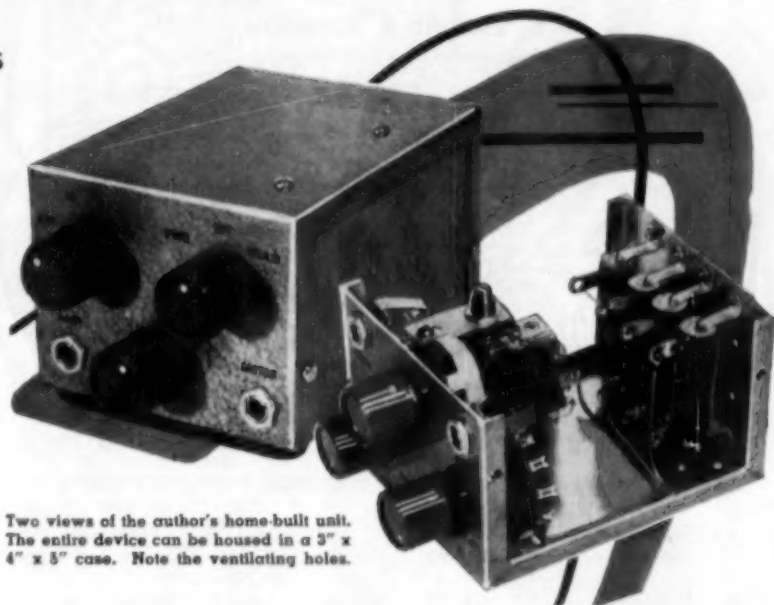
The adapter consists of dummy load resistors of 4, 8, and 16 ohms, a 400-cycle filter, and a meter-set control. The readily available parts are enclosed in a 3"x4"x5" grey hammertone finish aluminum case. No calibration of the unit is required. Its low cost, simple construction, and small size make it a worthwhile addition to any electronic tool kit or workshop.

To determine power output, a steady tone is fed into the amplifier, and the voltage appearing across a dummy load resistance is applied to the formula: "power equals the square of the voltage divided by the resistance." As Table 1 lists the values usually encountered in audio amplifiers, power can be read directly from this table without resorting to any pencil and paper work.

The principle behind the distortion measurements is equally simple. A 400-cycle tone is fed into the amplifier at a sufficient level to produce the output power desired for the measurement. A filter rejects the 400 cycles from the output and the residual voltage is measured by the meter. This residual voltage is the harmonics of the 400-cycle tone which are generated by the amplifier. As these harmonics were not present in the test tone, but produced by the amplifier, they are, therefore, distortion voltages. The percentage of harmonic distortion is the voltage at the output of the filter divided by the voltage at the input of the filter, multiplied by 100.

The meter-set control is provided so that the percentage of distortion can be read directly from the meter scale without requiring calculations.

In the schematic diagram, the two-section, four-position, shorting-type switch, S_1 , selects the dummy load resistors which are connected to the output of the amplifier under test. As 4, 8, and 16-ohm resistors of adequate power rating are not readily available, two 3-ohm and two 5-ohm, 25-watt units are used. With S_1 in the 16-ohm position, the four resistors are connected in series. For 8 ohms, a 3-ohm and a 5-ohm are connected in series. The 4-ohm load is obtained by a series-parallel connection. A fourth position of the switch, marked "Ext," is provided so that an external load resistor can be connected across the amplifier



Two views of the author's home-built unit. The entire device can be housed in a 3" x 4" x 5" case. Note the ventilating holes.

Construction details on an auxiliary device for checking audio harmonic distortion at full amplifier power output.

output if required. As shown in the photographs, ventilating holes are drilled in the back, top, and bottom of the case near the resistors to reduce their temperature rise.

R_3 , a 1000-ohm pot, is the meter-set control and is mounted on the front panel. The 400-cycle rejection filter is made up of CH_1 , C_1 , and C_2 , and the balancing control R_5 . An IRC type RQ11-121 pot, having a very short screwdriver slot shaft, is used for the balancing control. It is mounted under the choke by a flat bracket and a 2 3/4" length of brass rod, threaded for a #6 screw. A hole is drilled in the bot-

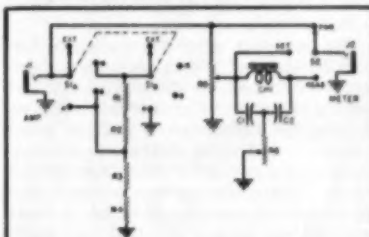
tom of the case directly under the control shaft so that it can be adjusted with a screwdriver when the case is closed. S_2 is a single-section, three-position, non-shorting rotary switch used to connect the meter jack, J_2 , across either the amplifier jack, the input of the filter, or the output of the filter.

(Continued on page 124)

Table 1. Voltages across load resistances as a function of power ($E = \sqrt{WR}$).

POWER (watts)	LOAD RESISTANCE 4 (ohms)	8 (ohms)	16 (ohms)
1	2.0	2.83	4.0
2	2.83	4.0	5.66
3	3.46	4.9	6.93
4	4.0	5.66	8.0
5	4.47	6.32	8.94
6	4.9	6.93	9.8
7	5.29	7.48	10.6
8	5.66	8.0	11.3
9	6.0	8.49	12.0
10	6.32	8.94	12.6
11	6.63	9.38	13.3
12	6.93	9.8	13.9
13	7.21	10.2	14.4
14	7.48	10.6	15.0
15	7.75	11.0	15.6
16	8.0	11.3	16.0
17	8.25	11.7	16.5
18	8.49	12.0	17.0
19	8.72	12.3	17.4
20	8.94	12.6	17.9
21	9.17	13.0	18.3
22	9.38	13.3	18.8
23	9.59	13.6	19.2
24	9.8	13.9	19.6
25	10.0	14.1	20.0

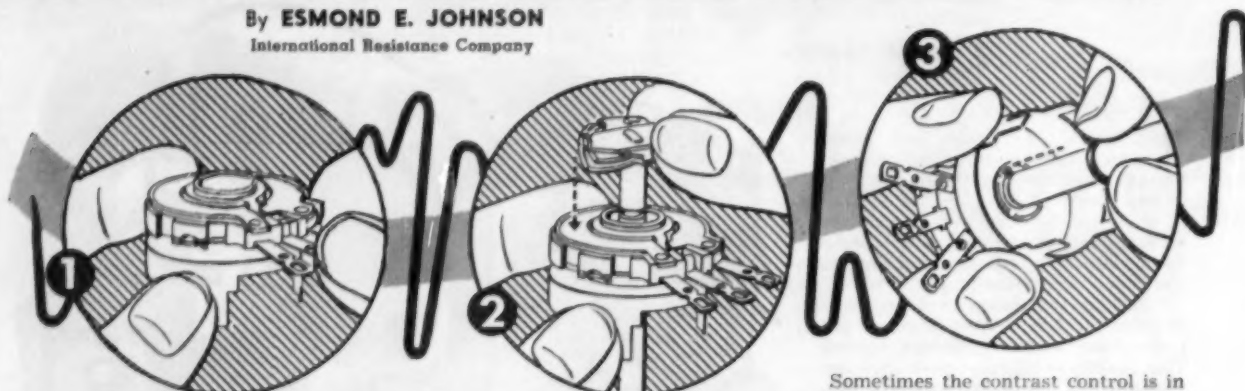
Complete schematic and parts list covering the distortion/power adapter. It was designed to be used with Heathkit AV-2.



R_1, R_2 —3 ohm, 25 w. wirewound res.
 R_3 —5 ohm, 25 w. wirewound res.
 R_4 —1000 ohm wirewound, linear taper pot
 R_5 —30,000 ohm linear taper pot
 C_1, C_2 —.068 μ d., 400 v. capacitor
 CH_1 —3.5 hz., 30 ma. choke (Stancor C-1080)
 J_1, J_2 —Open-circuit jack
 S_1 —D.p. 4-pos. wafer switch, shorting type
 S_2 —S.p. 3-pos. wafer switch, non-shorting type

CONTROLS FOR YOUR TV RECEIVER

By **ESMOND E. JOHNSON**
International Resistance Company



Part 2. How the various types of controls are used in typical TV sets, and the data you need to replace them.

IN LAST month's article, taper, power rating, and some other general characteristics of controls used in TV sets were discussed. The article ended with information on types of controls used in TV audio circuits and gave general replacement data for them.

This article will describe the controls used in the other sections of the typical television receiver. Before we do, however, there is one additional control that is often found in the audio section of TV sets. This is the ratio-detector balance control and it is used to compensate for any unbalance in components in the ratio-detector circuit to give better AM rejection and reduce intercarrier buzz. This control requires negligible power dissipation, making mechanical and taper requirements the only things to check.

TV sets using a 6BN6 gated-beam detector often have an AM rejection control which adjusts the bias of the 6BN6 to cause its operation to take place on the correct portion of its characteristic curve. This control is usually a small 1-watt wirewound type of special construction that can only be obtained directly from the manufacturer.

Video Section

The following controls can be found in the video section of a typical television receiver: automatic gain control level (a.g.c.), brightness control (also called background, brilliance, or shading), contrast or picture control, and in addition, a local-distant control.

The function of the a.g.c. level control is to adjust the operating point of the a.g.c. rectifier for the signal strength that is being received. For very weak signals, the control should be adjusted to give the least effect; for very strong signals, just the opposite is true. Since this control dissipates negligible power, the only requirement for

a replacement is mechanical construction, proper resistance, and taper.

Sometimes, this control varies the bias on the a.g.c. keying tube, changing the signal level at which this tube operates. When used in this way, its taper is linear and the control dissipates negligible power.

The brightness control adjusts the bias voltage between the cathode and the control grid of the picture tube to obtain the correct blanking or black level. In other words, this control is adjusted to the point where no vertical retrace lines are visible. Such controls are usually about 100,000 ohms and have approximately 100 volts across the element. This means that the control must dissipate about .1 watt (voltage squared divided by the resistance). This dissipation would be at an ambient temperature (operating temperature of air surrounding control) of about 60 degrees centigrade (140 degrees Fahrenheit) instead of 40 degrees centigrade (104 degrees Fahrenheit) where a .1 watt control would be rated. Therefore, a control rated from $\frac{1}{4}$ to $\frac{1}{2}$ watt would be satisfactory for this application. A linear taper is usually employed in this circuit.

The contrast or picture control adjusts the bias of the video output tube, thus controlling its gain. The current flowing through this control is approximately 10 milliamperes and its total resistance is usually 1000 ohms. Assuming that this current flowed through the entire 1000 ohms of the control, the power requirements would be .1 watt (current squared multiplied by resistance). However, the actual power dissipated is much less since the current decreases as the resistance in the control increases. This means that a $\frac{1}{4}$ - to $\frac{1}{2}$ -watt control would be a very safe replacement. The taper of this control may be R.H. (right-hand) log for smoother operation.

Sometimes the contrast control is in the plate lead of the video amplifier instead of the cathode lead. Frequently, this control is provided with two taps to which frequency compensating networks can be connected to give correct video response at different settings.

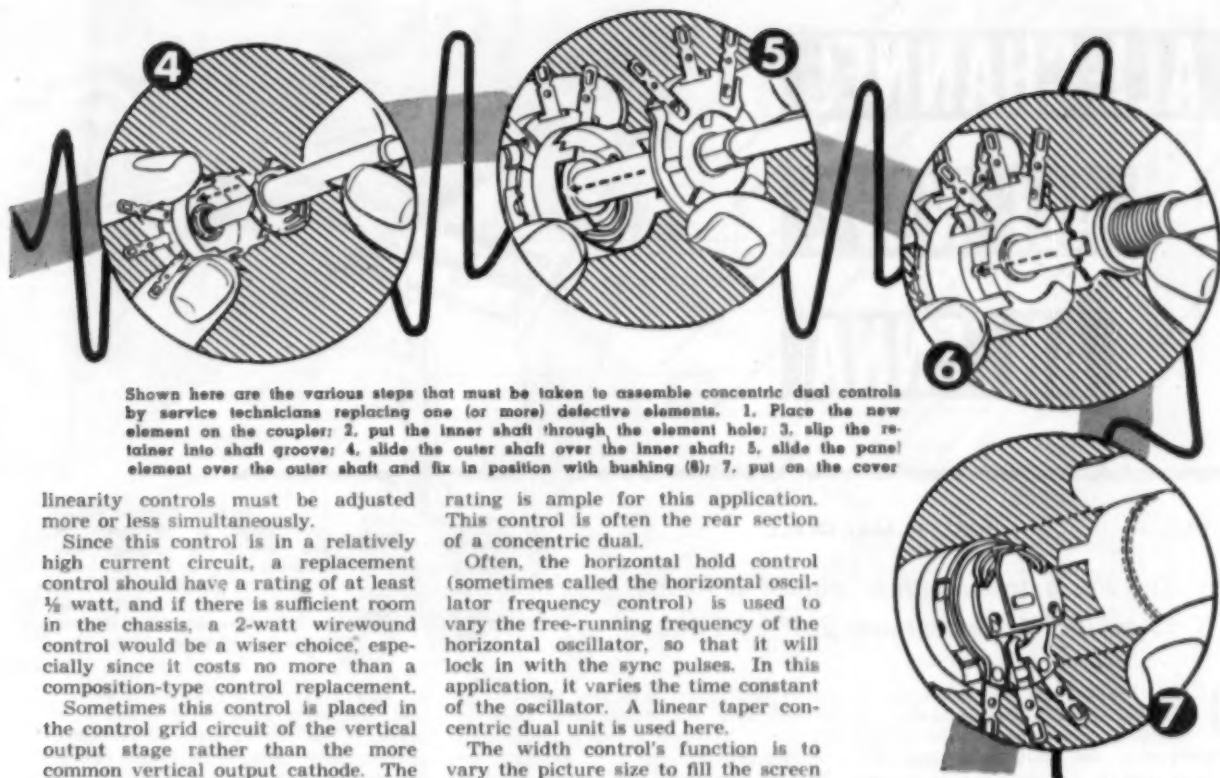
Vertical Sweep Section

In this section we generally find the following controls: height, vertical hold, and vertical linearity. Some sets have a vertical peaking control and, if we consider the sync separator circuits of some modern receivers as being part of the vertical sweep circuit, we have a new control known as the noise inverter control.

The height control is intended to adjust the picture so that it will fill the screen vertically. Generally, this control is in series with the plate of the vertical oscillator. Consequently, as the voltage on the plate is increased by decreasing the height control resistance, the output of the oscillator is increased, thus increasing the height of the picture. Any standard $\frac{1}{4}$ - or $\frac{1}{2}$ -watt control would have ample safety factor and would make a satisfactory replacement if it has a linear taper.

The vertical hold control adjusts the free-running frequency of the vertical oscillator so that it will keep in step with the transmitted vertical sync pulses. This is done by varying the time constant of the oscillatory circuit. This control operates at a very low voltage and a $\frac{1}{4}$ -watt control would be ample. The taper of this control is linear. This control generally forms the panel section of a concentric dual-type control which can either be obtained as an exact duplicate from a radio-parts dealer or assembled from parts which he has in stock.

To make the upper and lower half of the picture symmetrical, the vertical linearity control varies the bias on the vertical output tube so as to shift the tube's characteristic to a point where the sweep will be more linear. This also changes the gain of the output stage which, in turn, will affect the height. Consequently, the height and vertical



Shown here are the various steps that must be taken to assemble concentric dual controls by service technicians replacing one (or more) defective elements. 1. Place the new element on the coupler; 2. put the inner shaft through the element hole; 3. slip the retainer into shaft groove; 4. slide the outer shaft over the inner shaft; 5. slide the panel element over the outer shaft and fix in position with bushing (6); 7. put on the cover

linearity controls must be adjusted more or less simultaneously.

Since this control is in a relatively high current circuit, a replacement control should have a rating of at least $\frac{1}{2}$ watt, and if there is sufficient room in the chassis, a 2-watt wirewound control would be a wiser choice, especially since it costs no more than a composition-type control replacement.

Sometimes this control is placed in the control grid circuit of the vertical output stage rather than the more common vertical output cathode. The function of this control is the same as before, but signal bias is used instead of cathode bias to cause the tube to operate on the most linear portion of its characteristic. A control of $\frac{1}{4}$ - to $\frac{1}{2}$ -watt rating that meets mechanical and electrical specifications makes a good replacement. The taper of this control is linear.

The noise inverter control is used in a relatively new circuit which cancels out noise effects on synchronizing circuits by amplifying the noise pulses and feeding these amplified pulses back in opposite phase to the sync separator circuit, thus cancelling out any effects of noise. Any noise pulse that remains is in the negative region opposite the sync pulses and can cause no harm. The purpose of this control is to adjust for the noise condition of any particular locality. A control rated at $\frac{1}{2}$ watt and meeting mechanical and electrical requirements makes a satisfactory replacement. The taper of this control is linear.

Horizontal Sweep and High Voltage

In this section we have the horizontal hold, horizontal oscillator frequency, horizontal drive, and width controls. Another control that could be placed in this section is the electrostatic focus control for either high voltage or low voltage focus requirements.

Most times the horizontal hold control varies the voltage supplied to the plate of the a.f.c. tube to provide correct reactance to hold the oscillator in step with the transmitted sync pulses. A control of $\frac{1}{4}$ - or $\frac{1}{2}$ -watt

rating is ample for this application. This control is often the rear section of a concentric dual.

Often, the horizontal hold control (sometimes called the horizontal oscillator frequency control) is used to vary the free-running frequency of the horizontal oscillator, so that it will lock in with the sync pulses. In this application, it varies the time constant of the oscillator. A linear taper concentric dual unit is used here.

The width control's function is to vary the picture size to fill the screen horizontally. This may be accomplished by varying the screen voltage of the horizontal output tube, thus increasing or decreasing its gain which, in turn, increases the horizontal sweep or width. Even though this control (when used on such a circuit) only dissipates approximately 1 watt, a 4-watt control is required to obtain the required resistance. Any good 4-watt control with linear taper, correct size, and resistance, will make a satisfactory replacement. (We are not here concerned with width controls which are adjustable coils.)

The horizontal drive control under normal operating conditions has about 35 volts across half of its resistance which would require a control of about $\frac{1}{4}$ -watt rating. To take care of ambient temperature conditions and have a good safety factor, a $\frac{1}{2}$ -watt control should be used.

The focus control varies the sharpness of the electron beam to give a clean, clear picture without blur by increasing or decreasing the voltage applied to this picture-tube element. The voltage across this control is frequently the boosted "B+" which is about 500 volts. This would require a control of approximately .1-watt rating. Any good $\frac{1}{2}$ -watt rated control that will meet voltage breakdown, mechanical, and electrical specifications will be a satisfactory replacement. The taper is linear.

Low-Voltage Power Supply

The magnetic focus, horizontal centering, and vertical centering controls are found in this section.

Magnetic focusing sharpens the picture by varying the current through the focus coil to produce as small a beam spot as possible on the face of the picture tube. The rating of this control generally is about 4 watts, even though it actually may have only 35 volts across its terminals, which would make it dissipate approximately .6 watt. (The total resistance of the control is about 2250 ohms.) This, however, is not quite the case since, in one typical circuit, approximately .04 ampere is drawn through the contactor with a 5-volt drop in the control. At this setting, then, the control is at 125 ohms— $\frac{1}{16}$ of its total resistance. The power in this section of the control would be 5 volts multiplied by .04 ampere, giving .2 watt. For the whole control, therefore, a wattage of .2 times 18 or 3.6 watts is required.

The horizontal centering control places the picture in the center of the mask horizontally. This control is a 2-watt wirewound type with a linear taper, as is the vertical centering control.

This article has only scratched the surface on the various TV circuits in which controls are used. By the time this article is published, many new control requirements will have been created. This is especially true of color television, which uses many more controls with varied requirements. However, in all cases, the right taper, how to find it, and the power rating of the control are the factors the service technician must know to achieve quick and successful control replacement and TV set adjustment.

ALL-CHANNEL

ALL-WAVE

ANTENNA

By JOSEPH MARSHALL

Use this antenna with or without a rotator to pull-in TV channels over 200 miles away.

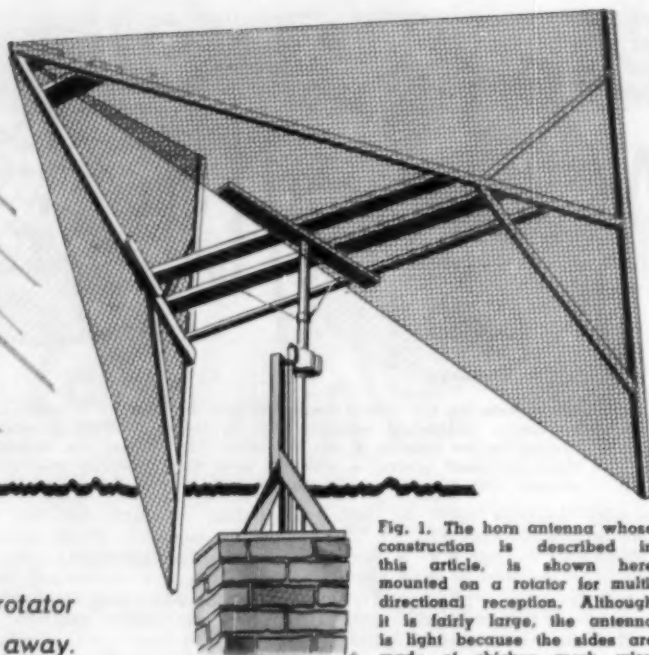


Fig. 1. The horn antenna whose construction is described in this article, is shown here mounted on a rotator for multi-directional reception. Although it is fairly large, the antenna is light because the sides are made of chicken mesh wire.

ONE of the most vexing problems in fringe area TV reception is that of obtaining multi-channel reception. Where only one or two stations are within reliable range, separate antennas for each channel is the ideal solution. However, where a location is within range of a number of stations both on the high and the low band, separate antennas become impractical.

It is true that there are a number of antennas which provide fair multi-channel or all-channel reception. Among these are the stacked conicals, modified yagis, and colinear arrays with reflectors. The trouble is that, being resonant, most of these arrays provide optimum pickup on only a few channels and optimum impedance match on even fewer and, unless some form of tunable matching network is used, they fail to deliver optimum gain. Moreover, their directional characteristics vary from channel to channel. They work well in the near-fringe areas but seldom live up to expectations in the far fringe.

The nonresonant, transmission-line rhombic antenna provides excellent gain on most of the channels and, being nonresonant, does not suffer mismatch losses from channel to channel. However, for appreciable gain on the low bands, a rhombic needs to be at least 40 feet long. Where all the stations lie in the same direction, a fixed rhombic provides an excellent solution; but since it is virtually impossible to rotate a rhombic 40 feet long, it is not suitable for reception from several directions.

Horn antennas have found great use in the microwave bands, notably in radio-relay systems, but they are not easily applicable to the v.h.f. TV frequencies because of their bulk, weight,

wind resistance, and the problem of transferring the signal from horn to feedline. However, some modifications on the conventional horn antenna, introduced by Dean O. Morgan of G-E, makes this antenna practicable for use on the TV frequencies. The first and most obvious was that of using wire instead of solid metal for the horn sides. The second was that of eliminating two sides of the horn. Since TV signals are horizontally polarized, only the two vertical sides of the horn are necessary. Finally, for a two-sided horn, the feedline could be connected to the two apexes. The result is an antenna which, although bulky, has extremely high gain, broad bandwidth, is capable of being rotated, and presents a nearly uniform impedance over a great frequency range.

Although the location at which the antenna shown in Fig. 1 is erected is 140 airline miles from Atlanta, Georgia—some 20 calculated miles beyond line of sight—phenomenally good reception is obtained on channels 2 and 5 in Atlanta. Channel 8, which could not be received with any degree of dependability despite considerable effort, has been brought in by the horn antenna where

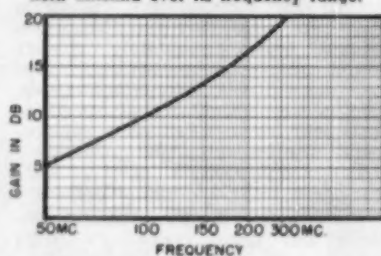
all others failed. Unlike most antennas, the horn apparently delivers in practice the theoretically determined performance. Moreover, it proved to be completely non-critical in construction, adjustment, and erection. Its performance is really phenomenal and very much worth the small trouble involved in its construction.

Fig. 2 gives the calculated gain of an 11-foot horn (mouth size) over that of a resonant folded dipole at each frequency. It will be seen that it provides almost 6 db gain on channel 2, over 9 db on channel 6, and between 15 and 17 db on the high v.h.f. band channels, as well as 10 db in the FM band. The impedance is 450 ohms on channel 2 and 400 ohms above that. Experience indicates that the theoretical gain is actually achieved in practice. In other words, the horn provides a gain equal to or exceeding that of most stacked commercial yagis on channels 4, 5, and 6; equal to that of a single commercial yagi on channels 2 and 3; and twice the voltage gain (or 4 times the power gain) of stacked yagis on channels 7 to 13.

Where channel 5 suffers from interference from an FM station, as it does in the author's neighborhood, use of a narrow-band yagi for that channel alone will reduce the interference. Channel 4 in Birmingham, Alabama, 200 airline miles distant, can be received almost constantly, and so can channel 3 in Charlotte, North Carolina, 225 miles away over the mountains. Sporadic reception of other stations has been experienced on almost every channel.

When the FM receiver was connected to the antenna, stations began to pop out of the noise all over the dial. Every FM station in Atlanta, even the

Fig. 2. Graph of relative gain of the horn antenna over its frequency range.



low-powered ones, is now received with full quieting almost 100 per-cent of the time. The receiver is extremely sensitive, to be sure, but nevertheless, only the three most powerful stations had ever been logged previously.

Finally, the antenna works more than adequately on the short-wave and broadcast bands with an "SX32" receiver. This, despite the fact that the antenna ceases to operate efficiently as a horn when its sides are smaller than one-half wavelength at the signal frequency received. Under these conditions, it becomes a very large, broadband conical dipole. The 11-foot antenna shown in Fig. 1 is resonant at about 20 mc. and gives good performance from about 13 to 40 mc. Below this, and especially at broadcast frequencies, it operates simply as a large pick-up sheet, and because of its area, absorbs a considerable amount of energy. It is not, of course, very directional below 30 mc. The antenna is, in effect, a single all-wave, all-channel radio and TV antenna, which is simply switched from TV to FM and AM receivers.

The results are all the more striking because the cost is very low and the construction simple. Fig. 3 gives the dimensions of an 11-foot horn. This is about 1 wavelength on channel 6 and was chosen because the necessary wood strips can be cut from a single 12-foot board, whereas longer boards are hard to find.

The four main wood strips are $1\frac{1}{2}$ inches wide and $\frac{3}{4}$ or $\frac{1}{2}$ inch thick. The various braces can be 1 inch wide, and the horizontal joining pieces should be about 4 inches wide. The two wire-covered triangles which form the sides are assembled first. Joints are made with $2\frac{1}{2}$ - and $3\frac{1}{2}$ -inch carriage bolts. The long cross pieces are drilled to take the horizontal boards, so that the horn can be assembled easily by setting and tightening bolts.

The wire for each triangular side can be cut from one 14-foot length of chicken wire, 5 feet high. The two triangles are assembled into the horn by bolting the cross pieces in place. Two vertical braces can be nailed at the mouth to keep the horn from twisting. The mast is mounted at the point of balance, which can be determined experimentally by moving the mount back and forth between or under the cross pieces until the point is found at which the antenna will balance itself horizontally. If a broad-based mast mount is used, no strutting or bracing is necessary.

Fig. 5 is a universal design chart for horns of various mouth sizes with a flare angle of 50 degrees. This is an excellent compromise angle; narrow enough to give sharp directivity and not so broad as to offer maximum resistance to the wind. Fig. 4 is a universal gain chart for a 50-degree horn. It will be noted that, whereas in ordinary antenna arrays the power gain doubles as the antenna size is doubled, in the horn antenna, the power gain is quadrupled as the antenna size doubles. The chart shows that a gain

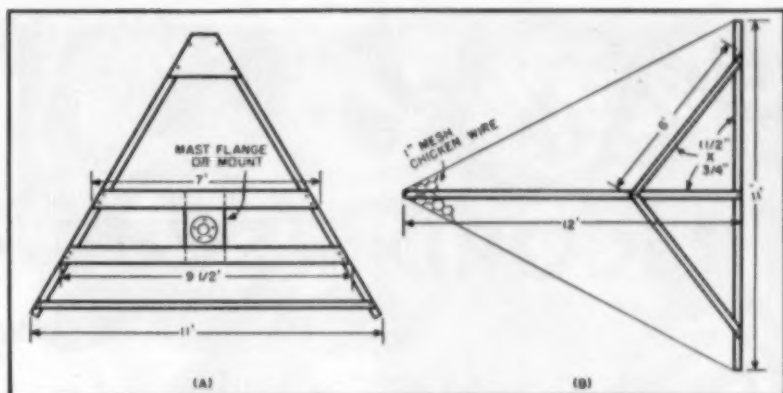


Fig. 3. Dimensions of the horn antenna designed for channel 6. (A) is the top view of the antenna structure, (B) is the side view for one of its sides.

of 20 db can be achieved with a horn $3\frac{1}{2}$ wavelengths wide at the mouth.

For vertically polarized signals, the horn can be turned so that the sides lie in the horizontal plane.

To use the design chart in Fig. 5, hold a straightedge joining the equal numbers on the lines AA' and A'A', which represent the desired mouth width and height. The point where the straightedge intersects the diagonal line B gives the length of the strip B in each side of the triangular sides. Thus, for instance, for a horn with a mouth 11 feet wide, the strip B is just a little over 12 feet long.

The antenna dimensions to suit your particular situation depend, of course, on the stations you desire to receive. It is best to cut the antenna for the center of the frequency range you are interested in. For TV, for example, channels 2 to 4 cover the frequencies from 54 to 72 mc.; channels 5 to 6, 76 through 88 mc.; channels 7 through 13, 174 to 216 mc., and channels 14 through 83 cover 470 to 890 mc. For channel 10, therefore, the lower frequency limit is 174 plus 18, or 192 mc. (Each channel is 6 mc. wide.) The wavelength you need is that of the video carrier, which is 1.25 mc. added to the lower frequency limit of the channel. For channel 10, the wavelength is 984 divided by $(192 + 1.25)$ or 5 feet.

There is plenty of room for improved mechanical engineering, al-

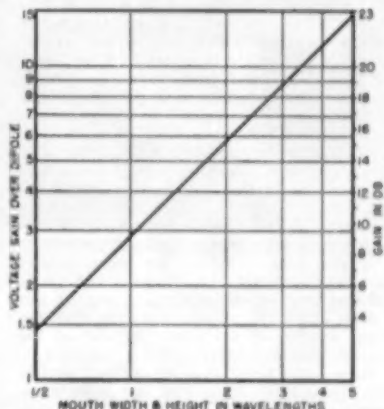
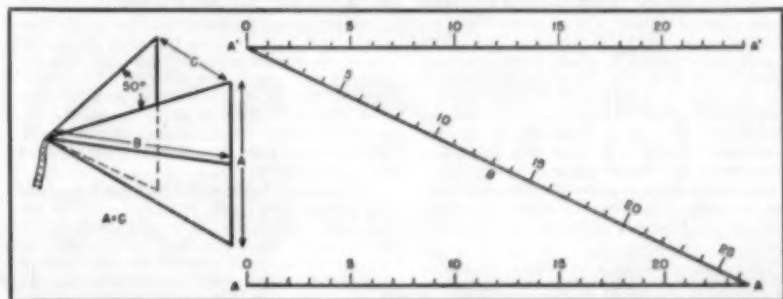


Fig. 4. Graph of antenna voltage gain for various horn antenna mouth widths.

though the model shown here has withstood winds of about 40 miles per hour. For instance, the booms could be made of aluminum tubing and the sides of wire or small-diameter tubing splines, as is done in corner reflectors. An all-metal design, however, would require that the horizontal cross pieces which form the two sides into a horn be insulated from each side.

The transmission line to the receiver is connected at the apex of the horn, one wire to the end of each triangle. Any good low-loss transmission line can be used.

Fig. 5. Nomograph for determining the length of the horn antenna sides, knowing the height and width (which are the same). To use, place a straightedge from the top line to the bottom line at the dimension chosen for the height, where the straightedge intercepts the diagonal line read off the length, shown as "B."



Certified RECORD REVUE

By BERT WHYTE

THIS department is published each month as a service to the readers of RADIO & TELEVISION NEWS. As such, it is my duty to try and satisfy the wants and wishes of the readers. The only way in which I am aware of your ideas and your wishes is through your letters. Naturally, it is quite impossible to satisfy each individual, so as far as I'm concerned—the majority rules. When a large percentage of you indicate a desire for some change or new procedure in my conduct of this column—if the suggestion is within the realm of practicability—I'll do my darndest to comply. The foregoing has been necessitated by a goodly number of letters from you nice people, asking for more reviews and more coverage. I'm flattered and grateful that more of my yak-yak is wanted, but I must admit this request has more than the usual number of problems. As always, the main bugaboo is space.

In a large circulation magazine like this one, space is all-important, and with many departments and articles vying with each other, such an animal as "extra space" is virtually non-existent! Some space can always be picked up by reducing the type face. This has already been done once with this department and I don't think any further reduction is practical. After all, I don't want you to squint yourself blind!

I have given much thought to this problem and have come to the reluctant conclusion that the only possible alternative is to reduce the length of the reviews. I don't like this idea at all. I feel that the "nice music-fine recording" type of review is just short of an insult to the record company and artists involved and is a disservice to the reader. Yet, your letters indicate that you want more coverage so I can't ignore this situation. Therefore, as an experiment this month, the reviews will generally be much shorter than is usual. I positively refuse to get to the point where the review will be little more than a "listing". I will still endeavour to give information about the record's place in the catalogue, the music, the artists and orchestras involved, the performance and the sound quality. If this information can be encompassed in a smaller space, then obviously more coverage will be possible. I'll give this idea a whirl this month and then I'll await your reaction. Please write and give me your opinions in this matter. If a majority of you like the format and the shorter reviews, they will be continued. If not, I will return to my "standard" format and hope that some day more space will be available.

Equipment used this month: Fairchild arm and cartridge, Components Corporation turntable, Marantz audio console, H. H. Scott

The opinions expressed in this column are those of the reviewer and do not necessarily reflect the views or opinions of the editors or the publisher of this magazine.

70-watt amplifier, Jensen "Imperial" system, Electro-Voice "Georgian".

RESPIGHI FESTE ROMANE VETRARE DI CHIESA (CHURCH WINDOWS)

Minneapolis Symphony Orchestra conducted by Antal Dorati. Mercury "Olympian" MG50046. RIAA curve. Price \$4.98.

Without much doubt, this is the loudest recording ever made! As a strictly sonic experience this is astounding. As a musical experience, the total effect is overwhelming. Not since the same conductor's notable reading of Stravinsky's "Le Sacre", has there been anything like this! "Feste Romane" receives here its third recording and competition crumbles before it... neither the Toscanini nor Ormandy recording can stand comparison. The Ormandy we can dismiss as badly outdated. The Toscanini version was blessed with some pretty good sound considering its age and other factors, but good as it was, it pales before the sheer magnificence of this effort.

From the opening stentorian blasts of trumpet and trombone, the thunder of tympani and bass drum, the coruscating clash of cymbals, and the head-splitting crash of great gongs, to the tinkling of tiny bells and the delicate tracery of the mandolin solo in the "October Festival" section and the frenetic trumpets, mocking trombones and myriad percussives of the "Epiphany", this is a sonic *tour de force* that is unlikely to be equalled for many a year!

Toscanini's reading was almost frantic in its intensity and he conducted at tempi which were almost unplayable. Dorati uses more directed energy, his tempi a little slower as he strives for a cleaner delineation of the complex score.

"Church Windows" has its premiere on LP on the flip side of the record and while generally in a quieter mood has passages which, if anything, are even louder and more awe-inspiring than the "Feste"! Particularly is this true of the section called "St. Michael the Archangel" and "St. Gregory the Great". Here we have the stunning roar of 32-foot organ pedals along with the blast of massed brass, the impact of bass drum and tympani and at the conclusion of the "Archangel" one of the most tremendous gong crashes ever recorded! This is really fantastic... after the initial transient impact, the reverberation of the undamped gong is heard for at least 15 to 20 seconds.

Throughout both works the sound is ultra-wide-range and with dynamics which are not quite believable. The vast climaxes are wondrously distortion-free, practically no pre- or post-echo is present and the acoustic perspective is quite unusual in its balance of "liveness" and superb inner detail. In fact,

I understand this recording represents a modification of the famous "Olympian" technique, in which instrument definition and orchestral textures are imbued with still more "living presence". Whatever the engineers did, this represents just about the present pinnacle of the recording art. No audiophile worthy of the name can afford to be without this recording!

MILHAUD CONCERTO FOR PERCUSSION AND SMALL ORCHESTRA CHAVEZ TOCCATA FOR PERCUSSION BARTOK MUSIC FOR STRINGS, PERCUSSION, AND CELESTA

Capitol P8299. RIAA curve. Price \$4.98.

Here is another "must" for the hi-fi fan! If this doesn't give you your fill of transients and percussives, you may as well go to work in a boiler factory. Yessir, you name the percussion instrument and you'll find it employed in one of these works. Felix Slatkin conducts his virtuoso Concert Arts Orchestra in the Milhaud work. If your speaker sounds like it's making some strident sound during this piece, don't get alarmed. The scoring is such that such notions are inevitable. Most women won't care for this at all! The Chavez work was reviewed last month as part of Capitol's new "High Fidelity Adventure" album. Only the third movement was on that disc and the two preceding movements here recorded are equally interesting and full of the bing and the bang. The Bartok is a re-issue of the old ten-inch album brought up to date by new processing and sounds better than ever. The Kubelik-Mercury reading is the better sound version of this work, but the use of the chamber group here is authentic and may be preferred by purists. A very good recording throughout, quite wide in range and with superb dynamics. The Concert Arts percussionists do the good work in the Chavez ably directed by Felix Slatkin and Harold Byrns and the Los Angeles Chamber Symphony show their competence in the Bartok work. No curve adjustment was necessary. Quiet surfaces in my copy.

CHORUSES FROM GERMAN OPERA Chorus and Orchestra of the Stadtische Opera, Berlin, conducted by Hansgeorg Otto. Telefunken TM68031. RIAA curve. Price \$2.98.

This little disc has some of the most beautifully balanced choral sound I have ever heard. In the "Entry of the Guests" and the "Pilgrims' Chorus" from Tannhauser you will hear a rich, full-bodied vocal tapestry, an altogether luscious sound. The smoothness of texture and the luminosity have to be heard to be believed. This is the sort of thing Telefunken has always excelled in and it is good to see their hand has not lost its skill since the war. From the orchestral standpoint, wait 'til you hear the trumpet fanfare in the opening bars of the "Entry"! Simply fabulous—mostly because of the incredibly live acoustics. The "Huntsman's Chorus" from Der Freischutz and another work receive equally splendid reproduction. The chorus is wonderfully trained and their discipline is fantastic. Don't fail to hear this one!

DEBUSSY LA MER IBERIA

NBC Symphony Orchestra conducted by Arturo Toscanini. Victor LM1833. RIAA curve. Price \$3.98.

A superb coupling and a superb recording. The "La Mer" is re-issued from a few years ago and has been re-processed with modern
(Continued on page 133)

MULTIPLE RECORDING WITH A SINGLE RECORDER

By JACK THORNTON

THE post-war years have seen the rise of "gimmick" phonograph recordings utilizing electronic effects. One of the most striking of these is multiple recording. Many persons have admired the one-man bands and single-person quartets created by this technique. But most have felt that such records must require a great deal of equipment. Such is not necessarily the case; multiple recordings can be made with a single tape machine plus an amplifier.

The author's article on artificial echo suggested a novel variation using the same equipment. With it the experimenter can produce interesting musical effects.

The normal procedure in multiple recording is to record, for example, a singer. The record is played back as the singer adds a second part. A second recorder tapes both the original and added parts. This is repeated for as many parts as desired. The two machines operate alternately as recorder and playback. But for the amateur workable results can be obtained with but a single tape recorder.

A reference to the previous article on artificial echo, which appeared in the April issue of this magazine, will show the basic operation of a typical tape recorder. That text dealt with adding an extra playback head *past* the regular head for creating added "liveness" in music and speech. In multiple recording the additional playback pickup must be mounted *ahead* of the erase head. The auxiliary head is mounted somewhere between the supply reel and the erasing head. Distance is not critical as it was in producing echo effects. Fig. 1 shows a typical location.

The additional head on the machine shown in Fig. 1 is clamped down with spring steel held under one of the original-equipment head's mounting screws. If space is available, the extra head may be mounted with wing-bolts through a slot cut in the machine's top surface.

As with the echo setup, choose a high or a low impedance head as required by the microphone input of your amplifier. A firm mounting is required

with the tape meeting the working surface of the pickup squarely. There is no advantage here in making the head adjustable in distance from the regular heads. If your machine is one having two or more original record-playback heads it may be possible to remove one of the heads and relocate it ahead of the erase head. (Unplug the machine while working as some erase heads have a high voltage across them whether the machine is running or not!)

Turning attention to the amplifier, wire the extra playback head into a microphone input of the amplifier. The article on echo circuits will offer wiring suggestions. Attach the amplifier's output to the high-level input of the tape machine. This input is marked "radio" on many recorders. Plug a pair of earphones into the tape recorder output. Now, plug a microphone into the amplifier's other mike channel and you're ready to make multiple recordings.

Among the points that should be noted in wiring is that the electrical terminals on the head should be attached by means of shielded wire of the type used to connect a phonograph pickup with its amplifier. On the other end of the wire you can attach a plug which will fit into the amplifier's microphone input. Keep the wire short to avoid unnecessary hum pickup.

Record the first time through in

a normal manner, using the microphone through the amplifier into the tape machine. The second time have the musician wear the earphones. Turn up the volume on the amplifier channel which is connected to the extra head. Operate the machine on "record." As the tape passes the auxiliary head the first recording will be picked up and fed through the amplifier to the tape machine. The musician will hear it on the phones and be able to sing or play along with it. The tape recorder will then erase the original recording, but will re-record it along with the added part. Additional parts may be added as skill allows. Each time the previous part or parts will be played back, erased, and re-recorded with the new part added.

On a few machines there is no output which will operate the earphones while the machine is recording. In such cases the headphones are attached to the amplifier output. Some amplifiers may require the addition of a preamplifier between the extra playback head and their microphone inputs, although this should be no problem if the head is selected to match the amplifier input impedance. Whether or not this is required depends solely on your particular equipment.

A little practice will give you the knack of this process and allow you to produce interesting multiple recordings.



Fig. 1. Wiring has been replaced here by white cords to show connections. Guitar's contact mike works directly into amplifier. A mike may be used.

By simply converting your present tape recorder or by adding another head, you can obtain some novel musical effects on a single tape, using only one tape recorder.

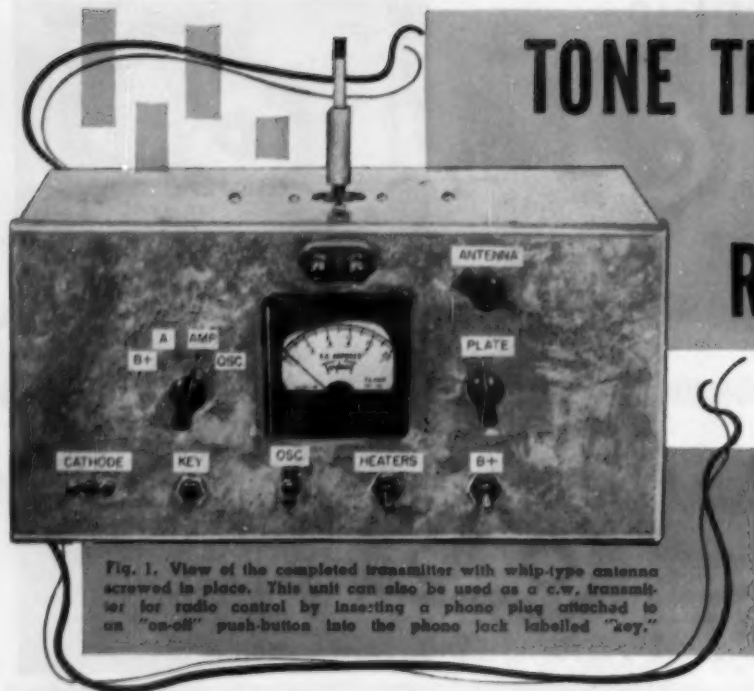


Fig. 1. View of the completed transmitter with whip-type antenna screwed in place. This unit can also be used as a c.w. transmitter for radio control by inserting a phone plug attached to an "on-off" push-button into the phone jack labelled "key."

Here's a transmitter that will give R/C model airplane and boat fans simultaneous control of 3 or more actions.

THE transmitter to be described here was designed to be used with carrier-operated or tone-operated 27.255-mc. radio-control receivers on the Citizens band. The input required is six volts from an automobile battery, and the output from the transmitter is about three watts.

An exterior view of the completed transmitter is shown in Fig. 1. This unit may be used to control the operation of a model airplane, boat, or racing car, and for various applications around the home or shop.

Refer to Fig. 2. The r.f. section consists of a 6AK6 (V_1) used as a tri-tet oscillator employing a tuned-cathode circuit. The output of the plate circuit is tuned via L_1 - C_1 to the third harmonic of the crystal frequency. (The third harmonic of a radio-control Citizens band crystal is 27.255 mc.)

The dropping resistor, R_1 , is chosen to allow a high enough voltage for proper operation yet not enough to cause crystal damage.

The final amplifier stage (V_2) requires no neutralization because of the internal construction of the 6AK6, provided that there is shielding between the grid and plate circuits. In construction, this is accomplished by building the plate circuit on the top of the chassis and shielding the plate pin with a small brass strip. (See Figs. 3 and 5.) The feed through the chassis is made right at the pin location.

Tuning is accomplished with a three-

plate variable capacitor, C_{12} , and a small fixed padder, C_6 . This was done to achieve a handsread type of tuning offering simplicity and accuracy, and to prevent bad mistuning which might damage the final tube.

The antenna is tuned by capacitor C_{13} . This is adjusted to give the desired current reading of fifteen milliamperes with the specified length of antenna in place, and the meter switch, S_2 , set to "Amp." Some re-adjustment of C_{13} may be necessary. Tune C_{12} to 15 milliamperes and then adjust C_{13} for a minimum reading. Keep repeating this process until the minimum is the required value.

The audio circuit is composed of a blocking-type oscillator where the size of the grid resistor (R_2 , R_3 , or R_4) determines the audio output frequency. Three capacitors for low, medium, and high frequencies (C_{14} , C_{15} , C_{16}) are connected from the plate of the oscillator tube to ground to improve the waveform by tuning the transformer.

Since it is necessary to ground both the desired grid resistor and capacitor at the same time, a double-pole, single-throw type push-button switch is used for each tone desired. When all the switches are open, the grid of the 9002 blocks and no tone is generated. The three switches are mounted on a control box that may be carried in the hand.

The size of the grid resistors shown on the schematic will produce tones of approximately 600, 1200, and 2500 cps.

By E. L. SAFFORD, Jr.

However, by making each resistance a two-megohm potentiometer, the tones can be adjusted to any frequency in the particular range covered by the capacitors. Additional tones may be produced by adding more potentiometers and connecting the correct capacitors.

A 6C4 voltage amplifier drives the 6AQ5 stage. The method of modulating the 6AK6 final amplifier by using a push-pull output transformer is simple, economical, and gives one-hundred-per-cent modulation.

The vibrator supply is standard, using a synchronous vibrator to reduce parts and battery drain. A keying jack, J_1 , is provided to allow breaking the carrier for use with carrier-operated receivers. With this type of receiver, it is recommended that the 6AQ5 be removed from its socket. No other change is necessary.

Two switches, S_1 and S_3 , are provided so that the heaters may be kept hot during standby periods.

The metering circuit allows tuning of the oscillator and final stages by measuring the current to each, and provides two voltmeter positions to give a check on "B+" and the "A" supplies. The shunts, R_5 and R_{10} , are chosen to give a 50-milliamperere full-scale reading with an 0-1 milliammeter which has a 27-ohm internal resistance. To find the actual current being drawn, multiply the reading obtained by 50. (For example, 15 milliamperes would read .3, etc.). Resistor R_6 allows a 500-volt full-scale voltage reading (multiply by 500), and R_{11} , a 10-volt full-scale reading.

Construction

Drill the holes in the large chassis (7"x11"x2") and in the front panel (13¼"x6½"), and then bolt the panel to the chassis. Install the meter, meter switch, final capacitor (C_{12}), and antenna capacitor (C_{13}). Next, assemble the V_1 cathode coil, L_1 , to C_1 and C_2 , and mount on the underside of the chassis as shown in Fig. 4. After installing the oscillator coil, L_2 , and its capacitor, C_3 , and the keying jack, check with a continuity meter to be certain that none of these parts are grounded to the chassis. When wiring

R_1, R_2, R_{11}, R_{12} —100,000 ohm, $\frac{1}{2}$ w. res.
 R_3 —1 megohm, $\frac{1}{2}$ w. res.
 R_4 —780,000 ohm, $\frac{1}{2}$ w. res.
 R_5, R_{10} —47 ohm, 2 w. wirewound res. (IRC Type BW)
 R_6 —15,000 ohm, $\frac{1}{2}$ w. res.
 R_7, R_{11} —470,000 ohm, $\frac{1}{2}$ w. res.
 R_8, R_{12} —1000 ohm, 1 w. res.
 R_9 —300,000 ohm, $\frac{1}{2}$ w. res.
 R_{10}, R_{11} —10,000 ohm, $\frac{1}{2}$ w. res.
 C_1 —100 μ fd. mica capacitor
 C_2, C_{10} —140 μ fd. variable capacitor
 C_3 —0.3 μ fd. paper capacitor
 C_4 —25 μ fd. variable capacitor
 C_5, C_6, C_{10} —25 μ fd. paper capacitor
 C_7 —100 μ fd. capacitor
 C_8, C_{11} —300 μ fd. mica capacitor
 C_9 —10 μ fd. mica capacitor
 C_{10} —25 μ fd. variable capacitor (Reduce to 3 plates)
 C_{11} —0.01 μ fd. paper capacitor
 C_{12}, C_{13}, C_{14} —0.1 μ fd. paper capacitor
 C_{15} —0.03 μ fd. paper capacitor
 C_{16} —0.5 μ fd. paper capacitor
 C_{17}, C_{18} —25 μ fd., 25 v. elec. capacitor
 C_{19}, C_{20} —10 μ fd., 450 v. elec. capacitor
 C_{21} —1 μ fd., 600 v. paper capacitor
 C_{22} —0.05 μ fd., 1600 v. paper capacitor
 C_{23} —5 μ fd. paper capacitor
 CH_1 —10 hy., 30 ma. choke
 J_1 —Shorting jack, normally closed
 L_1 —13 i., ± 16 airwound, $\frac{1}{8}$ " dia. spaced $\frac{1}{2}$ dia. of wire
 L_2 —11 i., ± 16 airwound, $\frac{1}{8}$ " dia. spaced dia. of wire; top 3 i. from plate end
 L_3 —11 i. "Miniductor" ± 1015
 L_4 —2 i. hook-up wire closewound around cold end of L_3
 M_1 —0-1 milliammeter
 RFC_1 —2.5 mhy. r.f. choke
 RFC_2 —44 mhy., 7-35 mc. r.f. choke (Ohmite Z-14 or equivalent)
 S_1, S_2, S_3 —D.p.s.t. push-button normally open, leaf switch
 S_4 —S.p.s.t. toggle switch
 S_5 —D.p., 3 pos. non-shorting rotary switch
 T_1, T_2 —Output trans., 4000 ohms to v.c. (Tried 5-31X)
 T_3 —Vibrator trans., 260 v. d.c. at 60 ma. (Merit P2972)
 $Xial$ —27.255 mc. crystal
 V_1 —Vibrator, 6-volt synchronous
 V_2 —6AK6 tube
 V_3 —9002 tube
 V_4 —6C4 tube
 V_5 —6AQ5 tube

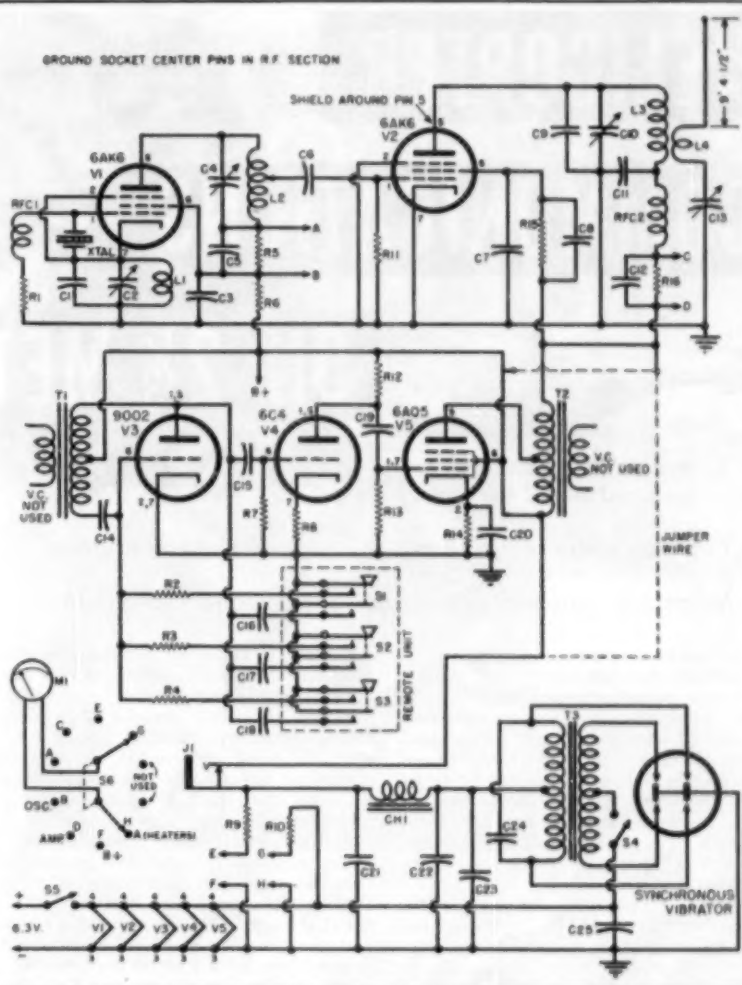


Fig. 2. Complete schematic diagram and parts list for the tone transmitter for R/C. The jumper wire shown dotted is used during the preliminary adjustment of the final amplifier stage. The meter switch positions correspond to points on schematic.

the oscillator section, take care to keep r.f. leads at least one-half inch from the chassis.

Wire the heater circuit next, using

the chassis as one lead. Insert the heater switch, S_5 , in the hot lead from the battery. Run a short lead to the "B+" switch, S_4 , from the S_5 terminal

connecting to the heater circuit. Connect the other side of switch S_4 to a terminal strip in the vibrator section (Continued on page 95)

Fig. 3. Top view of the tone transmitter with the audio sub-chassis on the left. The two binding posts on the top of the front panel were used in the original design and can be omitted.

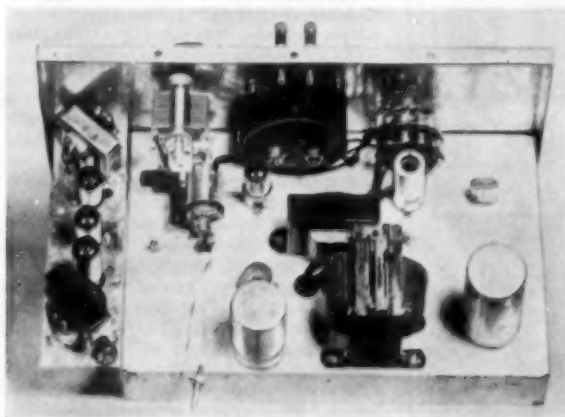
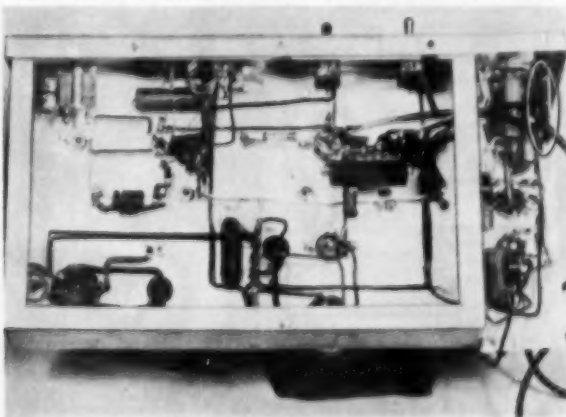


Fig. 4. Bottom view showing parts layout. The box containing the switches for transmitting the tones is connected to the main chassis by means of the terminal strip on the subchassis.

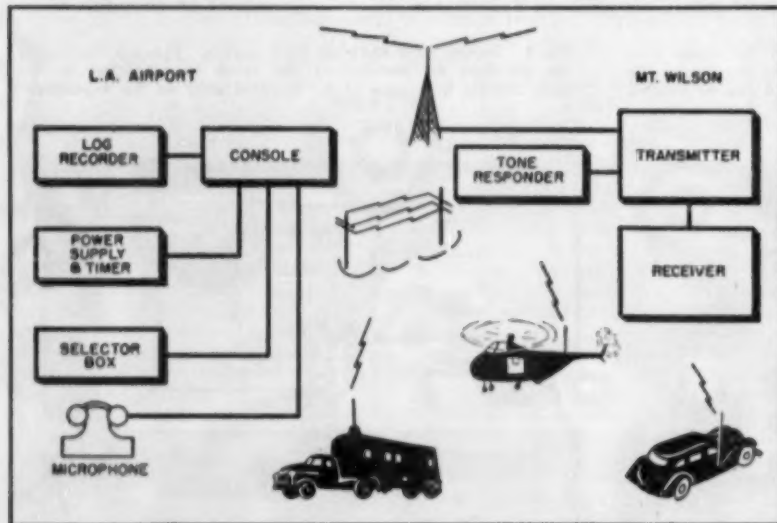


ON 2 $\frac{1}{3}$ METERS

Supt. of Comm., Los Angeles Airways, Inc.

The problem of a "mobile" and subordinate station for ground vehicles was solved by using the commercial brother of the *Gonset* "Two-Meter Communicator" which consists of a crystal-controlled transmitter and crystal-controlled receiver known as the Model 3043SX. The *Gonset Company* made a number of modifications to adapt its equipment for this system and hams who have used this two-meter gear will agree that its ver-

Functional block diagram of the radio system used by Los Angeles Airways, Inc.



satility as a mobile as well as fixed station would lend itself to this application.

For a mike, the operators turned to *American Microphone Company* for a suitable unit. The firm recommended its C501C, a coil-cord carbon unit. Subsequent tests showed good results and the microphone was added to the ground station package.

Further modifications were necessary, however, to provide adequate circuit control. This "party-line" type of system could be saturated quickly without a "net-control" for traffic. Further, the system could be rendered useless by virtue of the very fact that made it possible—the high elevation of the base station. That is, subordinate stations in one valley could intercommunicate and not realize that they were transmitting at the same time as other subordinate or mobile stations in one of the other valleys with the end result that the system would be blocked.

The control system adopted was the *Motorola* "Quik-Call". This system provides that the mobile and subordinate stations can only be activated by the base station. This makes for better circuit utilization and efficiency since remote operators are not saturated with traffic between other stations of the system. The remote operator knows that when the receiver is turned on and a message is transmitted that the message is for his station.

Needless to say, the commercial equipment for this installation all required some modification to adapt it to the particular requirements. In some instances the modifications were simple ones consisting of the additions of capacitors to alter the relay operation, modification of the audio output circuits, etc.

The system as it now stands permits the dispatcher to issue "group calls" to seven individual stations at a time. This feature is used in transmitting blanket messages of concern to the entire segment of the system or can be used to locate a calling station whose identification may have been missed.

Another feature is that the "Quik-Call" can be used to turn the transmitter on or off. The base station is linked with its remote control site, some 25 air miles distant, by a single audio pair, and through the use of this feature of the tone system the base station is automatically turned on when the dispatcher depresses his microphone switch. The transmitter is keyed on and holds until the dispatcher releases his microphone switch.

Future planning includes the installation of tone responders in the aircraft to relieve pilots of the chore of listening to traffic not concerning their flight.

The system is presently licensed for 17 stations but will be expanded as required. The passenger and mail-express flights are currently utilizing all facilities—so such expansion will be needed soon.

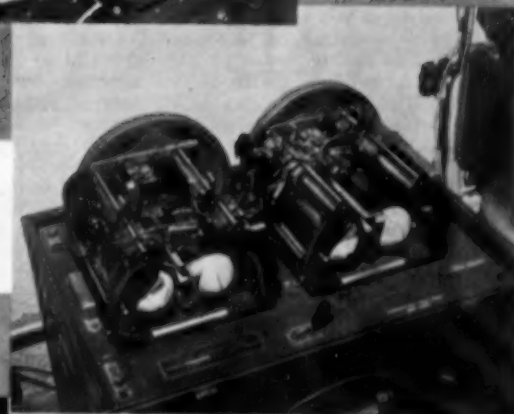
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Communications operations center of L. A. Airways showing interoffice phones, communications system handset, selector box, console, and tower monitor.



Cockpit of Sikorsky S-55 showing airborne radio control unit. Radio keying switch is on stick.

Base station automatic recording system for recording transmission to and from all units of the radio system.



A mobile communications unit installed in a LAA car.

THE "SOUPED-UP VIKING I"



Front view of the author's "Viking I" after modification. Note the 660 holes that have been drilled in the top for heat dissipation. Unit on top of transmitter is a variable voltage adjuster. Refer to text.

By **JOSEPH W. SEMKOW, W7HUP**
Senior Field Engineer
Raytheon Manufacturing Company

How one ham "hot-rodded" his "Viking I" to provide increased power. A similar technique could be applied to other rigs.

MOST of us are not happy with our transmitters for very long, with the result that we are constantly striving to get the utmost out of our rigs. For the three years that the author has been operating his Johnson "Viking I" at an average input of 200 watts, he has been deluged with questions from other hams on how they, too, could duplicate this operation. A number of these questioners have adapted the circuitry to their own rigs and are enjoying similar performance. For the benefit of other "Viking I" owners, the changes will be described in this article.

Whenever it is possible to increase power 3 db (twice power) without too much expense or too great difficulty, the technique for accomplishing this increase is well worth investigating. The added power helps make up for other deficiencies that may exist in the ham station, such as poor antenna or location and QRM. Before going ahead with the suggested changes to your "Viking," certain principles and points should be understood by the reader. Facts will be presented and substantiated by meter readings.

The author's transmitter was purchased second-hand and has been in operation for over three years. Operating time averaged about 1500 hours per year at 200 watts. No major part failures have occurred. The original 4D32 tube is still in the circuit and has never shown any perceptible color on its plate. Plate voltages on the 4D32 and 807 modulators are 800 volts d.c. Plate current to the final amplifier averages between 275 and 285 ma. Static plate current on the 807 modulators

averages 75 to 85 ma. On modulation peaks it increases to approximately 200 ma. Slight coloring of the plates is visible but does not hinder or harm any of the components.

Grid current is always adjusted at this station until no further increase in antenna power output is noted. Any current in excess of the necessary amount for optimum output is wasted in tube heating and harmonic generation.

The manufacturer of the "Viking" transmitter rates the power transformer and filter choke as capable of 350 ma. continuous duty at normal temperatures. Most transformers and chokes can sustain considerable overloading without any failure if some method of cooling is provided. This will be one of the modifications required. The transformers are encased in a dust shell which also protects the windings from getting scuffed or damaged. They are so well enclosed that the windings do not get ventilated and cooled. Directions are given in another part of this article for cooling the transformers. Before modification, the 4D32 operated conservatively at 600 volts d.c. and 250 ma. as suggested by the manufacturer, but extensive tests conducted by the author over a three-year period at inputs in excess of 200 watts (800 volts d.c. @ 250 to 300 ma.) have resulted in no apparent damage to the tube or other components.

To increase the audio power output of the 807 modulators and improve the general quality of the "Viking I" some changes are made to the speech amplifier and driver stages. In the original "Viking," as designed by the manufac-

turer, a 6AU6 type tube was utilized to drive the 807 modulators. This was adequate when powers of 50 or 60 watts were desired for inputs of 100 to 120 watts. When the power to the final is "souped-up" to 200 watts input, this becomes inadequate. The following steps were taken. First, it was decided that it was poor policy to try to drive the 807 modulators with a high impedance driving source such as the 6AU6 tube. It is a much better voltage amplifier than a power driver. The author made up a small right-angle aluminum bracket and mounted a miniature socket on this bracket. This assembly was mounted underneath the chassis of the "Viking" near the speech amplifier circuits (see photo). A 6AQ5 was installed in the socket and wired as a triode. The former 6AU6 driver circuit, of course, was disconnected.

The original feedback loop from T_4 , the modulation transformer, to the cathode of the former 6AU6 driver is removed and modified as follows: The new negative feedback loop consists of R_{11} and C_5 . The feedback is now impressed on the cathode of the driver and helps correct for any distortion that may be created in either the driver or modulator stages.

The former 6AU6 is now utilized as a voltage amplifier to drive the 6AQ5. The screen resistor is changed to a 1 megohm, $\frac{1}{2}$ watt unit similar to the first stage 6AU6. Both stages now have 1 megohm screen resistors. Additional filtering is added to the screens in the form of 20 μ f. capacitors (see schematic). The cathode resistor of the second 6AU6 (former driver) is now changed to a 2000 ohm, $\frac{1}{2}$ w. unit. Degenerative feedback is encouraged at this point and no capacitor should bypass this cathode.

By shunt-coupling the driver tube to the driver transformer T_1 , we improved the quality. No d.c. current on the primary results in the absence of magnetizing current and its associated ill effects on the transformer.

Now we increase the power output capabilities of the "Viking" transmitter. First, remove the 5R4G rectifiers and their associated octal sockets. Install two 4-prong *Amphenol* or equivalent sockets. Rewire the filament circuit so that it is in series across both of the sockets rather than in parallel. This provides 2½ volts a.c. across each tube socket. Install 866A type rectifiers of the 3B28 type. Do not try 816's or 866 Jr.'s as they cannot handle the current needed. Do not be concerned about the slight additional filament current requirements of the 866's. Bring the transformer high-voltage leads to the top caps of the 866A's and you have completed another step in the

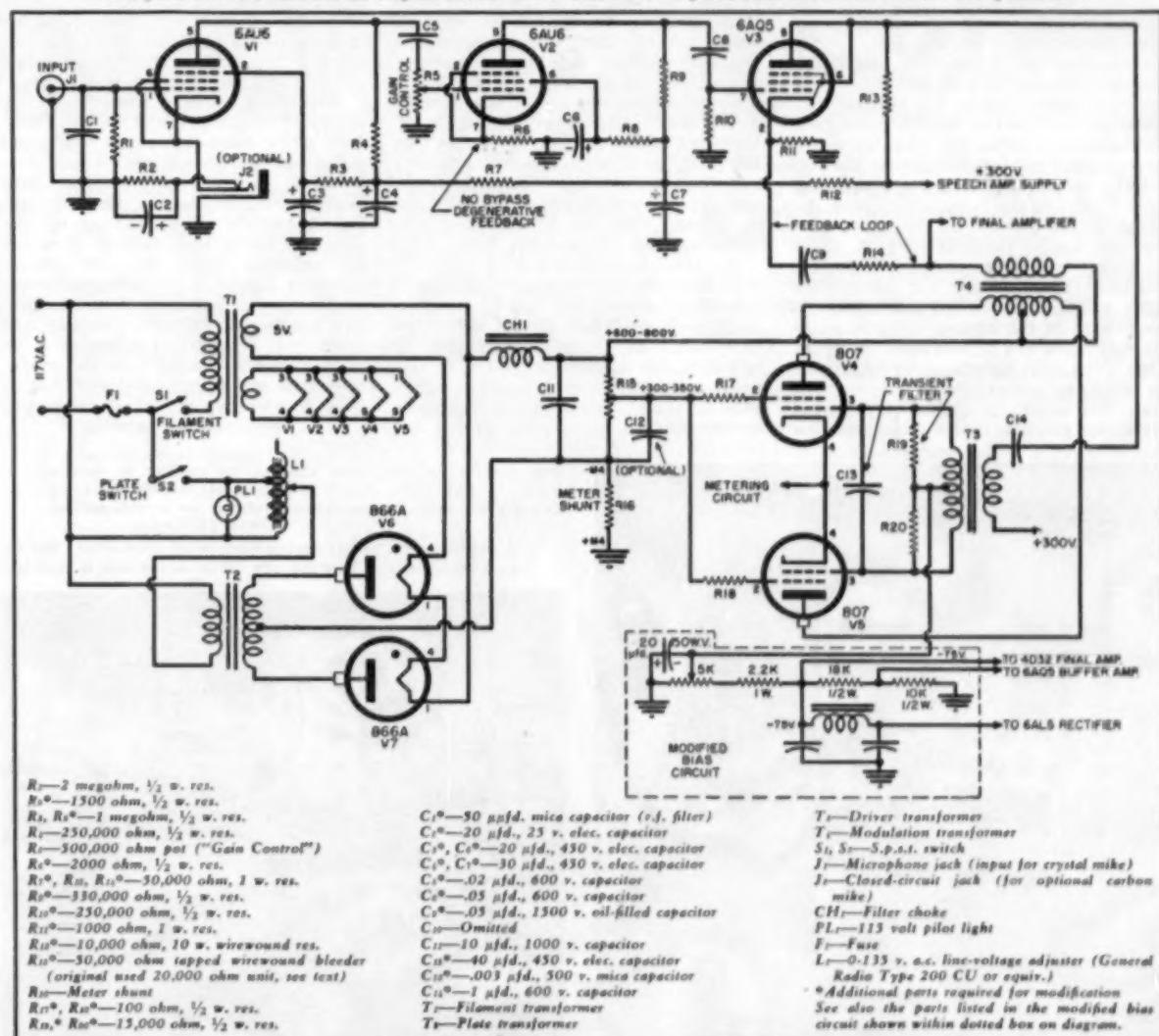
modification. Just making this change alone without having done anything else to your transmitter will improve performance. It does two things. It eliminates the former high voltage internal drop of the 5R4G. This drop varies with load which makes the problem more severe. The modulator current does vary considerably under modulation, therefore, the internal resistance in the 5R4G rectifiers varies and provides poor regulation. You probably have already noticed that under 100% modulation, plate current in the final amplifier varies considerably under modulation. With the 866A installation you will note a stabilizing of this final amplifier current variation and also a decided increase in plate voltage. The voltage which previously was approximately 600 to 650 volts d.c. will now be from 650 to 720 volts d.c., with correspondingly increased current drawn by both the final amplifier and modulator.

With the change to 866A's and increased high-voltage output, static current on the modulators will have to be correspondingly reduced as suggested in the *Johnson* manual. Adjust the tap on R_{10} , the bleeder resistor, until you draw approximately 75 to 80 ma. At this point it might be mentioned that additional filtering, in the form of a 30 or 40 μ fd., 450 v. capacitor, would not impair transmitter quality if it were installed from the tap to ground. This additional filter would tend to hold the screen voltage variations to a minimum under modulation. This is desirable but not necessary. Changing the bleeder to a higher value would be also desirable, although not necessary. It would help to reduce the heat caused by the increased voltage now across the bleeder.

To further increase power so that you can operate at 200 watts input or better, another modification is necessary. The rectifier change will permit

a power input of from 150 to 175 watts but the next change will permit a further increase in power. At the rear and center of the "Viking" chassis there is room to mount another Amphenol 4-prong socket. If you already have a line voltage adjuster then your expenses are minor. If you don't own such a unit you will have to "big deal," "beg," or buy one. A short cable connects the adjuster to the back of the "Viking" chassis via a 4-prong plug which plugs into the socket therein. The high-voltage primary is brought out to this socket. If one decides to sell his transmitter it is a simple process to insert a dummy plug with appropriate jumpers and restore the "Viking" to its original condition, less the adjuster. See schematic on this modification. The line-voltage adjuster provides a means of lowering the voltages for "tune-up" purposes and operation with lower power for local "rag-chewing." This provision is deemed neces-

Schematic diagram of the "Viking I" with the changes incorporated as suggested by the author. The starred items in the parts list were added to the original circuit. A 1-w miscellaneous parts, such as sockets, etc., are not specified.



sary since the "Viking" is now a "hot-rod" and must be operated as such. This is particularly important when changing bands where it is possible for the final amplifier to be far from resonance and operating with full grid drive. When the line-voltage adjuster is cranked wide open so that one has approximately 130 volts on the primary of the high-voltage transformer it causes a decided increase in exciting current of the primary. This appears in the form of heat and brings us to the problem of adequate cooling.

Although the author's "Viking" has been operated for over three years without cooling recently the following precautions have been adopted. Formerly it was impossible to touch the top of the transmitter case or any of the internal parts, especially the transformers. The heating was considerable. After some research into the possible harmful effects of heating on transformers and other components the following changes were made. See photos of perforated top of the transmitter case and transformer shells.

You may find some better means for mounting your blower or may decide to use another type; nevertheless, a blower is advisable. The author mounted a small 4-bladed blower just above the crystal holder and on the vertical aluminum shield which divides the crystal compartment from the final amplifier. See photo. The blade hangs over the vertical shield and part of the blast cools the 4D32 and the remainder moves the heat which collects at the upper part of the case. Transformers T_1 (high voltage) and T_2 (modulation) as well as CH_1 (filter choke) are dismantled. The shells are removed and drilled as indicated in the photographs. A number of holes are drilled into the upper top, sides, and bottom sides to provide a chimney effect for air movement near the windings. Some of the wind from the fan penetrates these holes for

cooling. Six-hundred and sixty $\frac{1}{8}$ " holes are drilled $\frac{1}{8}$ " apart on the top case to further vent any heat. With this additional modification it was possible to operate at 250 watts input with room temperatures of 75 degrees for several hours and upon checking the temperature of the transformers and cabinet found that they were only comfortably warm. Cooling should be a "must" in the modification of the "Viking."

By the way, while you have the shell removed from the modulation transformer it is a good idea to bring the 807 plate leads out the top of the shell through $\frac{1}{8}$ " grommets.

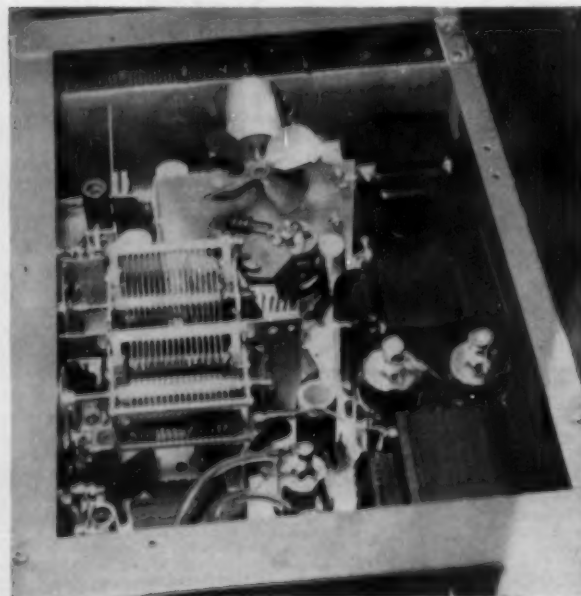
Another worthwhile modification is the adjustable modulator bias provision. With the increased plate voltage applied to the modulator one should correspondingly increase the negative bias to the 807's. This problem can be easily remedied by referring to the schematic and following information. Assuming the negative bias to be from -35 to -40 volts at full power, one can readily see that when the plate voltage is reduced in order to work some local or to operate at, say, 50 watts input, a condition arises where the bias voltage would be excessive and in the cut-off region of the 807's. This would cause excessive distortion at low power. By merely drilling a $\frac{1}{8}$ " hole just above the "drive-control" on the front panel and mounting a standard 5000 ohm, 2 watt potentiometer, we can control the bias to suit any condition. Wire the control and bias circuits as per schematic.

We should take hints from our good friends in the high-fidelity business and use ample decoupling and filtering in the speech amplifier. This transmitter is capable of exceptional quality if wired in the manner indicated in the schematic. Contrary to general belief that all that is necessary is communications quality, the author of this ar-

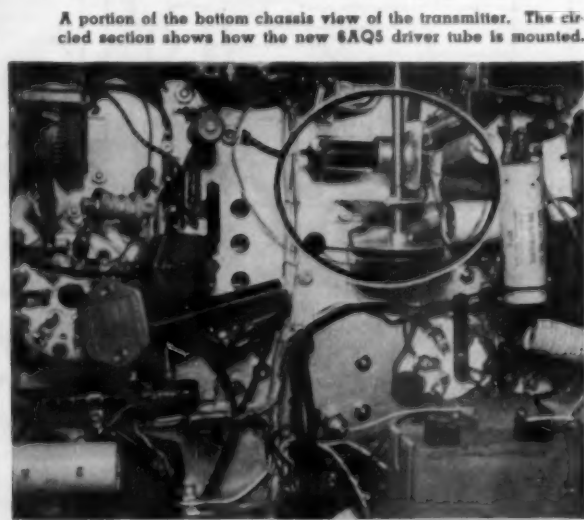
ticle firmly believes that good quality will work more DX than restricted speech response. By nature and in our everyday life, we as individuals are accustomed to listening to a reasonably wide range of frequencies both extreme lows and the highs. When we endeavor to modify this to some limited range, we create a falsetto or unreal situation. How many times have you tried to listen to a phone signal when your receiver was switched into the crystal sharp position. All you saw was your "S" meter reading, possibly, an "S7" level but practically no audio was audible. Therefore, it behooves us not to cut out the lows excessively or we have no modulation when listened to by sharp receivers. Conversely, if we reduce highs excessively and encounter a great deal of QRM no intelligence is possible. A signal with a good share of highs can often be read when the receiver is considerably detuned from the carrier frequency. Too wide a band-pass, of course, takes up considerable room in the spectrum. To summarize, the author feels that too much stress is placed on reducing the lows because they consume too much power and too many restrictions on the highs likewise cause a dropping of intelligence.

The modified "Viking" will give excellent audio response from 70 to 5000 cycles. The quality will be relatively free from excessive phase shift and distortion and should have clean sidebands. Transmitters equipped with clippers and limiters improperly adjusted can do more to mess up the amateur bands than transmitters not so equipped. Often we read articles claiming 3 db or more increased power output by just adding a clipper or limiter (audio), but careful listening and study will reveal that although 3 db more signal is available to the modulator it is of a type loaded with distortion. The human ear is accustomed to

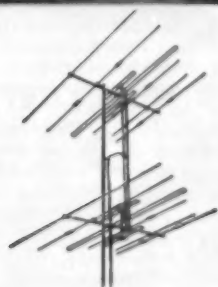
(Continued on page 120)



Top view of the transmitter showing the cooling procedures adopted. Note holes drilled in transformer cases and in top and the four-blade blower mounted above the crystal section.



A portion of the bottom chassis view of the transmitter. The circled section shows how the new 6AQ5 driver tube is mounted.



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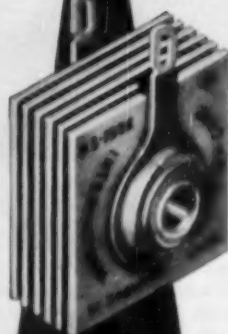
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THE "MIDGETAPE"

* Over-all view of the *
* new Mohawk recorder. *



*Details on the world's first pocket tape recorder which
handles a full hour's conversation with 100% accuracy.*

THE world's first pocket-sized, battery-operated tape recorder which measures a mere 8½" long, 3¾" wide, and 1¾" deep and weighs just three pounds, one ounce, has been unveiled to an eager public.

Designed especially for salesmen, lawyers, business executives, reporters, doctors, students, sales engineers, etc., this new *Mohawk* unit will record a full hour's conversation with 100 percent accuracy. The magnetic tape is wound inside a cartridge, about the size of a pack of cigarettes, which is simply slipped into the instrument with no tape threading required. The tape itself is ¼" iron oxide, plastic base twin-track "Mylar" type.

The recorder operates at 1½ ips and the recorded material can be played back through any suitable amplifier or an accessory amplifier with a 2" speaker, which is available for use with this recorder. A headphone jack is included for that type of listening if desired.

The recorder has only three controls, records for a full hour on its dual-track tape, and simultaneously erases old material as new recordings are made. Rewind is manual. The three controls consist of an "on-off" switch, "playback-record," and "volume." Color marks on the volume control function as the recording level indicator.

Frequency response is 200 to 5000 cps, which makes the recorder suitable for voice recording of the non-musical variety.

Power for this unit is obtained from two hearing-aid type batteries. The motor-filament battery life is estimated to be approximately 45 hours. The "B" battery life has been set at 100 hours. A battery-life indicator in the form of a small light goes off when the battery has less than two hours recording life remaining.

The motor operating voltage is 9 to 7 volts d.c. while the filament voltage for the two CK549DX's and the one CK542DX is 1.3 volts d.c. The "B" supply voltage is 30 volts. The motor

speed control consists of an electro-mechanical governor.

The input is high impedance, permitting any good microphone to be used with this recorder. The output is 3 milliwatts at 2000 ohms. Signal-to-noise ratio is 40 db and over-all gain is 70 db. Two sockets, one for the microphone and the other for the earphone-amplifier, are incorporated.

The recorder comes complete with a recording cartridge, batteries, crystal microphone, and earphone—the whole unit retailing for \$229.50.

In addition to the original equipment, a variety of accessories is available for use with the recorder, including extra recording cartridges, a throat microphone, "wristwatch" microphone, crystal microphone, concealable lapel microphone, a telephone adapter, the previously-mentioned amplifier with its 2" speaker, an external power supply, a carrying case, battery packs, single and double earphones, microphone extension cords, a shoulder "holster" for carrying the unit, etc.

One important feature of this recorder is that it will operate anywhere, even when the user is traveling by car, plane, or train. The small recording cartridge is mailable—a nice feature for the traveling business executive.

Plans are underway to offer a special briefcase housing for the recorder and a foot pedal for operating the device. These accessories are still under development but will be offered shortly by the manufacturer.

As pointed out previously, this recorder is not intended to be used for high-fidelity recording and playback. Rather, its function is to provide a permanent record of conversations, etc., for business purposes.

The "Midgetape" is available at leading photographic, recording, and business machine dealers throughout the United States. For information on where it can be seen in certain areas, contact the manufacturer, *Mohawk Business Machines Corporation*, at 944 Halsey Street, Brooklyn 33, N.Y. -50-



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B. L. Jordan Seattle, Washington	1st Class	20 Weeks

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Mac's RADIO SERVICE SHOP

By JOHN T. FRYE



UNUSUAL NEW EQUIPMENT

BARNEY was a little late to work, and he was hurrying, so he almost knocked down the customer emerging from the service shop carrying a tape recorder in his hand. However, with the quick reflexes of youth, he not only managed to avert the near collision but transformed it into a flourishing gesture of holding open the door. As he hurried into the service department of the radio and TV repair shop he found Mac, his boss, busily engaged in applying a coating of high-voltage shellac, or "corona gunk" as it was familiarly known, to the secondary coil of a horizontal deflection transformer that had developed a "blow-out" at a point where a primary lead had sagged against the winding.

"There," Mac said as he put the combination cork-and-application-brush back into the bottle, "when it dries, that ought to hold the arc. That's the third coating I've put on, and each layer is supposed to provide about 10,000 volts worth of insulation. Unless the winding itself has been damaged, we've probably saved the owner the cost of a new transformer. Don't turn this set on, though, until that dope has thoroughly dried. It'll catch fire when it's wet."

Barney was not paying too much attention. Instead he was eyeing three intriguing-looking boxes the parcel post man had left lying on the bench. "What's in these?" he demanded.

"Three pieces of rather out-of-the-ordinary service equipment," Mac said as he began opening the smallest package. "You know I've always maintained a service technician ought to snoop around a bit in other fields now and then to see if he can't find equipment there that will make his own job easier. What you see here is the re-

sult of taking some of my own advice. First, there is this little transistor receiver that measures only five inches by three inches by an inch and a quarter. It's the very first practical transistor radio to hit the market, and it's a true superhet, with two i.f. stages, a.v.c. ferrite core antenna, and ear-phone jack for a hearing-aid type ear-phone accessory. I think it can be very useful to us in service work."

"How?"

"I'll show you just as soon as I insert this 22½-volt hearing aid battery that powers it," Mac said as he snapped the back of the case on the little set and turned it on. Instantly the shop was filled with a surprising amount of volume. "Watch now," Mac said as he turned the receiver slowly about with his hand. At two points, one hundred and eighty degrees apart, the volume of the reception fell off sharply.

"When I was playing with one of these at the store, I noticed the null positions of the receiving loop were very sharp and positive. That gave me the idea we can take the little set up on roofs with us and use this directional characteristic to aim TV antennas. Every city with a TV transmitter around here also has one or more radio stations that can be easily picked up on this sensitive little job. As far away as we are, the radio tower and the TV antenna in each of these towns can be considered as being in the same direction from us for all practical purposes. S-o-o-o, all we have to do is find out where the little receiver says the radio station is and then point the TV at that point of the compass, and we'll have it right on the nose. What's more, this little set will be a jim-dandy to tuck in your shirt pocket when you

are going out on a noisy reception complaint. You can tell at once if the noise is in the set or not. And I anticipate that in many cases this tiny little portable will lead us right to the source of the noise."

"You know what I think?" Barney asked as he watched Mac fondling the plastic case of the little set.

"No, and I'm not sure I want to find out," Mac replied cautiously.

"I think you're just trying to hatch up some good reasons so you can buy that little set and charge it up to the shop."

"Could be!" Mac said with a guilty grin. "I never could resist as neatly an engineered piece of electronic gear as this is; and when you consider it is the first practical transistor receiver—well, you know I still have the first crystal receiver I built and my old Radiola II—"

"Okay," Barney said with an understanding smile. "I don't blame you a bit. What's in those other packages?"

"Here's a pair of prism binoculars," Mac said as he removed them from their leather case. "They are made in the American zone of Germany; and while they are quite reasonable in price, they have a lot of good features. They are seven power and have 35 mm. objectives. All air-to-glass optical surfaces are coated with magnesium fluoride for better light transmission and to cut down reflections. Central focussing is used with provision for separate adjustment of the right-hand barrel. They have a hinged bridge and weigh only 16½ ounces and the field of view is 405 feet at 1000 yards."

As he chanted off these features, Mac walked to the front of the store and gazed through the binoculars at the rooftops across the street.

"Hey, let me look," Barney said as he tugged at Mac's elbow.

Obediently Mac surrendered the glasses, and Barney peered through them.

"Holy cow!" he exclaimed as he lowered the binoculars and then glanced through them again. "These things are powerful. Those TV antennas look like they're standing right outside the window. I can see every bolt, wing-nut, and rivet in them. These things surely show up my coffee nerves, though. It's hard to hold them still."

"That's why I didn't buy higher-powered ones," Mac explained. "Seven-power glasses are about as strong as can be satisfactorily hand held. At that, they make anything seem seven times closer than it really is. Few towers around here exceed seventy feet; so that means we can bring the antenna down to ten feet with the glasses. My thought is that these glasses will save a lot of leg work in climbing around on roofs and towers to inspect antennas and lead-ins. By watching the antenna while it is turned with the motor, we can spot troubles such as broken lead-lines, irregular motor action, loose elements or stacking bars, broken insulators,

(Continued on page 121)



Heathkit PRINTED CIRCUIT 5" COLOR TV Oscilloscope Kit

MODEL
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\$69⁵⁰
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The technical specifications for this fine instrument speak for themselves. Vertical channel sensitivity is 0.025 volts RMS/inch at 1 Kc. Vertical frequency response is essentially flat to 5 Mc, and down only 1.5 db at 3.58 Mc. Ideal for Color TV work!

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An essential instrument for professional Laboratory, or for servicing mono-chrome or color TV.

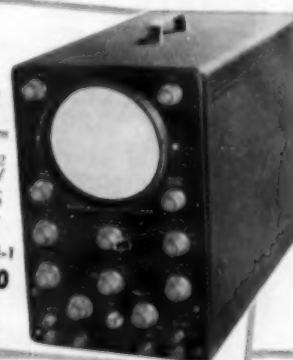
Heathkit PRINTED CIRCUIT 3" OSCILLOSCOPE KIT



This light, portable 3" oscilloscope is just the ticket for the ham, for service calls, or as an "extra" scope in the shop, or lab. Measures only 9 1/2" H x 6 1/2" W x 11 1/4" D, and weighs only 11 lbs. Employs printed circuit board for improved circuit performance. Vertical amplifiers flat within +3 db from 2 cps to 200 Kc. Vertical sensitivity 0.25 volts RMS/inch peak-to-peak, and sweep generator operates from 20 cps to 100,000 cps. R.F. connection to deflection plates.

MODEL OL-1
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This full-size 5" Oscilloscope incorporates many outstanding features. Vertical channel flat within +3 db, 2 inch peak-to-peak sensitivity at 1 Kc. Sweep operation from 20 cps to 100,000 cps. Built-in peak-to-peak voltage calibration—3 step frequency compensated input attenuator—phasing control—push-pull deflection amplifiers. Printed circuits for reliable performance and reduced construction time.

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Once calibrated, this instrument provides a known peak-to-peak voltage standard for comparison with unknown voltage values on an oscilloscope. Panel calibrated directly—no involved calculations required. Operates within a voltage range of .01 to 100 volts peak-to-peak.



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Heathkit 20,000 ohms/volt MULTIMETER KIT

MODEL MM-1
\$29⁵⁰
Shpg. Wt. 6 lbs.

Features comprehensive range coverage. 20,000 Ω /V D.C. and 5000 Ω /V A.C. Ranges: 0-1.5, 5, 50, 150, 500, 1500, and 5000 V. direct current from 0 to 150 μ A, 15 μ A, in 5 steps. Center-scale resistance of 15, 1500 and 150,000 ohms, and db from -10 to +65.

Uses 1% precision resistors—50 μ A meter—molded bakelite case.

Heathkit DIRECT-READING CAPACITY METER KIT



MODEL CM-1
\$29⁵⁰
Shpg. Wt. 7 lbs.

Extremely valuable where speed and convenience are essential. Quality control work, production line checking, etc. Reads capacity directly on meter scale, from 0-100 mfd., 1000 mfd., .01 mfd. and 1 mfd. Residual capacity less than 1 mfd. Not susceptible to hand capacity.



Heathkit A. C. VACUUM TUBE VOLTMEETER KIT

MODEL AV-2
\$29⁵⁰
Shpg. Wt. 5 lbs.

Measures AC voltage only, from 10 cps to 50 Kc. Covers the range from 1 millivolt to 300 volts in 10 steps at high impedance input. Incorporates full 10 ranges of db scale from -52 db to +52 db. Essential in the audio laboratory or for audio enthusiasts and experimenters. Provides sensitivity essential for low level audio measurements.

Heathkit ELECTRONIC SWITCH KIT



MODEL S-2
\$23⁵⁰
Shpg. Wt. 11 lbs.

This device will electronically switch between 2 input signals to produce both signals alternately at the output. Used in conjunction with an oscilloscope, it will permit the observation of 2 signals simultaneously. Provides switching rates from 10 cps to 200 cps.

HEATH Company
A SUBSIDIARY OF DAYSTROM INC.
BENTON HARBOR 15, MICHIGAN

Heathkit TUBE CHECKER KIT



MODEL TC-1
\$29.50
Shpg. Wt. 12 lbs.

Because of its low price this fine tube tester is available, not only to the service shop and laboratory, but to part-time servicemen, experimenters, and radio amateurs, as well. Will test all tubes commonly encountered in radio and TV service work. Simple "GOOD-BAD" scale on the 4 1/2" meter. Tests for open, short, and quality on the basis of total emission. Includes illuminated roll chart. Fourteen different filament voltage values available. Separate lever switch for each tube element.

Model TC-2P is the same electrically as TC-2, except that it is housed in a beautiful two-toned portable carrying case. Only \$34.50. Shpg. Wt. 15 lbs.

Portable carrying case available separately for Model TC-2, or older model TC-1. Cab. No. 91-B, \$7.50. Shpg. Wt. 7 lbs.
CRT Test Adapter, Model 355 for use with the TC-2, \$4.50. Shpg. Wt. 1 lb.

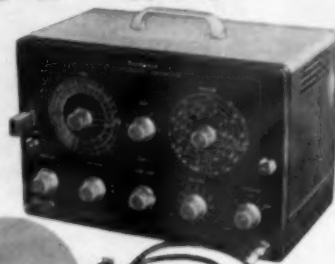
SELECT YOUR NEXT HEATHKIT FROM

Heathkit TV ALIGNMENT GENERATOR KIT

Here is the complete R.F. signal source for FM and TV alignment, (both monochrome and color). Provides output on fundamentals from 3.6 Mc to 220 Mc in four bands, with harmonic output usable up through the UHF channels. Electronic sweep circuit eliminates mechanical gadgets and accompanying noise, hum, and vibration. Continuously variable sweep up to 0-42 Mc, depending on base frequency.

Variable marker (19-60 Mc on fundamentals) and crystal marker (4.5 Mc and multiples thereof) generators built-in. Crystal included with kit. Provision for external marker if desired.

Packed with outstanding features, 50 ohm output impedance—exceptionally good linearity—effective AGC action—plenty of R.F. output. An essential instrument for the up-to-date service shop.



\$49.50

MODEL TS-4
Shpg. Wt. 16 lbs.



Shpg. Wt. 8 lbs.

MODEL SG-8
\$19.50

Heathkit SIGNAL GENERATOR KIT

This is one of our most popular kits, and is "serviceman engineered" to fulfill the signal source requirements of the radio serviceman and experimenter.

Covers 160 Kc to 110 Mc on fundamentals (5 bands), with output in excess of 100,000 microvolts. Calibrated harmonics extend usefulness up to 220 Mc. Choice of unmodulated R.F. output, 400 cps modulated R.F. output, or 400 cps audio output. Step-type and continuously variable output attenuation controls.

Coils are prewound, and construction manual is complete. Calibration unnecessary for service applications.

Model RS-1

Heathkit RESISTANCE SUBSTITUTION BOX KIT



Provides switch selection of 36 RTMA 1 watt standard 10% resistors, ranging from 15 ohms to 10 megohms. Numerous applications in radio and TV work.

\$5.50
Shpg. Wt. 2 lbs.

Heathkit CONDENSER SUBSTITUTION BOX KIT

Very popular companion to Heathkit RS-1. Individual selection of 18 RTMA standard condenser values from .0001 mfd to 22 mfd. Aluminum panel, bakelite case, and includes 18" flexible leads with alligator clips.

Model CS-1
\$5.50
Shpg. Wt. 2 lbs.



Model DR-1

Heathkit DECADE RESISTANCE KIT

Twenty 1% precision resistors provide resistance from 1-99,999 ohms in 1 ohm steps. Indispensable around service shop, laboratory, ham shack, or home workshop.

\$19.50
Shpg. Wt. 4 lbs.

Heathkit DECADE CONDENSER KIT

Provides capacity values from 100 mmf to 0.111 mfd in steps of 100 mmf. +1% precision silver-mica condensers used. High quality ceramic wafer switches for reduced leakage.



Shpg. Wt. 3 lbs.
\$16.50

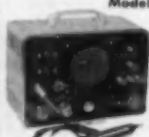
Heathkit CONDENSER CHECKER KIT

Measures capacity in four ranges from .00001 to 1000 mfd. Power factor control is provided for indication of electrolytic condenser efficiency. Tests capacitors under actual load conditions. Checks resistance from 100 ohms to 5 megohms. Direct reading scales for all tests. No calculation necessary.



Model C-3
\$19.50

Shpg. Wt. 7 lbs.



Model T-3

Heathkit VISUAL-AURAL SIGNAL TRACER KIT

\$23.50

Shpg. Wt. 9 lbs.

This signal tracer features a high-gain R.F. channel and probe to permit signal tracing from the receiver antenna input through the R.F. and I.F. stages. Separate low gain channel for audio circuits. Both visual and aural indication by means of speaker and electron beam "eye" tube.

Also noise locator circuit, wattmeter, and terminals for "patching" output transformer or speaker into external circuit.

Heathkit LABORATORY GENERATOR KIT

Here is a signal generator for use where high accuracy and metered performance are essential. Covers 150 Kc to 30 Mc on fundamentals in 5 bands, 400 cps modulation variable from 0 to 50%. R.F. output at 50 Kc from 100,000 to 1 μv. Meter reads R.F. output in μv. or modulation percentage. Fixed-step and variable output.



\$39.50
Shpg. Wt. 16 lbs.



Model M-1

Heathkit HANDITESTER KIT

\$14.50

Shpg. Wt. 3 lbs.

The M-1 is literally pocket size to fit in your coat pocket, tool-box, glove compartment, or desk drawer. Measures A.C. or D.C. v. in 5 steps from a full scale minimum of 0-10 v. to a maximum of 0-5000 v. Measures direct current at 0-10 Ma and 0-100 Ma, and provides ohmmeter ranges of 0-3000 and 0-300,000 ohms. Sensitivity of 1,000 ohms v. 1% precision divider resistors employed.

HEATH Company

A SUBSIDIARY OF DAYSTROM INC.
BENTON HARBOR 15, MICHIGAN

THESE HIGH QUALITY INSTRUMENTS

Heathkit HARMONIC DISTORTION METER KIT



MODEL HD-1

\$49.50

Shpg. Wt. 13 lbs.

Performs the functions of more elaborate and much more expensive audio distortion testing devices and yet is simple to operate and inexpensive to own. Used with a sine wave generator, it will check the harmonic distortion output of audio amplifiers under a variety of conditions. Essential in audio design work.

The HD-1 reads harmonic distortion directly on the meter as a percentage of the original signal input. It operates from 20 to 20,000 cps in 3 ranges, and incorporates a VTVM circuit for initial reference settings and final harmonic distortion readings. VTVM ranges are 0-1, 3, 10, and 30 volts full scale. 1% precision voltage divider resistors used. Distortion meter scales are 0-1, 3, 10, 30 and 100% full scale. Having a high input impedance the HD-1 requires only .3 volt input for distortion tests.

Heathkit AUDIO GENERATOR KIT

This basic audio reference generator deserves a place in your Laboratory. Complete frequency coverage is afforded from 20 cps to 1 Mc in 5 ranges, and output is constant within ± 1 db from 20 cps to 400 Kc, down only 3 db at 600 Kc, and 8 db at 1 Mc. An extremely good sine wave is produced, with a distortion percentage below 0.4% from 100 cps through the audible range.

Plenty of audio output for all applications; up to 10 v. under no load conditions. Output controllable with a continuously variable or step-type attenuator with settings of 1 μ v, 100 μ v, 1 v, and 10 v. Cathode follower output.



MODEL AG-8

\$29.50

Shpg. Wt. 11 lbs.



Model PS-3

\$35.50

Shpg. Wt. 17 lbs.

Heathkit VARIABLE VOLTAGE POWER SUPPLY KIT

Provides regulated DC output for B+, and 6.3 v. AC at 4 amps. for filaments. Output variable from 0 to 500 v. DC at no load, linear from 0-10 ma at 450 vdc and 0-130 ma at 200 vdc! Essential for circuit design and development. Voltage or current read on 4 1/2" meter.



Model QM-1

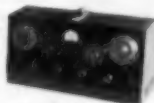
\$44.50

Shpg. Wt. 14 lbs.

Heathkit "Q" METER KIT

Will measure Q of condensers, RF resistance and distributed capacity of coils, etc. Uses 4 1/2" 50 μ a meter for direct indication. Will test at 150 Kc to 18 Mc in 4 ranges. Measures capacity from 40 mmf to 450 mmf within ± 3 mmf. Useful for checking wave traps, chokes, peaking coils. Indispensable for coil winding and determining unknown condenser values.

Heathkit IMPEDANCE BRIDGE KIT



Model IB-2

\$59.50

Shpg. Wt. 12 lbs.

Measures resistance, capacitance, inductance, dissipation factors of condensers, and the storage factor of inductance. Employs 2-section CRT dial. D, Q and DQ functions are combined in one control. 1/2% resistors and capacitors used in critical circuits. 100-0-100 microammeter for null indications. 1000 cycle oscillator, 4 tube detector-amplifier, and power supply built-in.

Heathkit 6-12 VOLT BATTERY ELIMINATOR KIT



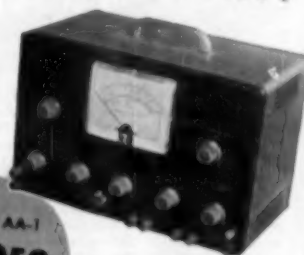
Model BE-4

\$31.50

Shpg. Wt. 17 lbs.

Furnishes 6 or 12 volt output for the new 12 v. car radios in addition to 6 v. models. Two continuously variable output voltage ranges: 0-8 v. DC at 10 A. continuously or 15 A. intermittent, 0-16 v. DC at 5 A. continuously or 7.5 A. intermittent. Output voltage is clean and well filtered by two 10,000 mfd condensers. Panel meters read voltage and current output.

Heathkit AUDIO ANALYZER KIT



MODEL AA-1

\$59.50

Shpg. Wt. 13 lbs.

The AA-1 consists of an audio wattmeter, an AC VTVM, and a complete IM analyzer, all in one compact unit. It offers a tremendous saving over the price of these instruments purchased separately.

Use the VTVM to measure supply ripple, response, output gain, power noise, frequency, etc. Use the wattmeter for measurement of power output. Internal loads provided for 4, 8, 16, or 600 ohms. VTVM also calibrated for DBM units so db gain or loss can be noted quickly.

High or low impedance IM measurements can be made. High (6 Kc) and low (60 cps) frequency generators built-in. Only 4 meter scales are employed, and one of these is in color so that results are easily read on the scale. Full scale VTVM ranges are .01 to 300 volts in 10 steps, full scale wattmeter ranges are .15 mw to 150 w in 7 steps. IM analyzer scales are 1%, 3%, 10%, 30% and 100%.

Heathkit AUDIO OSCILLATOR KIT



MODEL AO-1

\$24.50

Shpg. Wt. 10 lbs.

(SINE WAVE - SQUARE WAVE)

Features sine or square wave coverage from 20 to 20,000 cps in 3 ranges. An instrument specifically designed to completely fulfill the needs of the serviceman and high fidelity enthusiast. Offers high-level output across the entire frequency range, low distortion and low impedance output. Uses a thermistor in the second amplifier stage to maintain essentially flat output through the entire frequency range. Produces good, clean square waves with a rise time of only 2 microseconds.



MODEL BR-2

\$17.50

(Less Cabinet) Shpg. Wt. 10 lbs.

Heathkit BROADCAST BAND RECEIVER KIT

Build your own receiver with confidence. Complete instruction book anticipates your every question.

Features transformer-type power supply, high-gain miniature tubes, built-in antenna, planetary tuning from 550 Kc to 1600 Kc, 5 1/4" speaker. Also adaptable for use as AM tuner or phono amplifier.

CABINET: Fabric covered plywood cabinet available, complete with aluminum panel and re-inforced speaker grille. Part No. 91-9, Shpg. Wt. 5 lbs., \$4.50

HEATH Company

A SUBSIDIARY OF DAYSTROM INC.

BENTON HARBOR 15, MICHIGAN

New

Heathkit DX-100 PHONE AND CW TRANSMITTER KIT



MODEL DX-100

\$189⁵⁰

Shpg. Wt. 120 lbs.

Shipped motor freight unless otherwise requested. \$50.00 deposit required for C.O.D. orders.

This one compact package contains complete transmitter, with built-in VFO, modulator, and power supplies. Provides phone or CW operation—VFO or crystal excitation—and band-switching from 160 meters through 10 meters. R.F. power output 100—125 watts phone, 120—140 CW. Parallel 6146's modulated by push-pull 1625's. Pi network interstage and output coupling for reduced harmonic output. Will match non-reactive antennas between 50 ohms and 600 ohms. TVI suppressed with extensive shielding and filtering. Rugged metal cabinet has inter-locking seams.

The high-quality transmitter is packed with desirable features not expected at this price level. Copper plated chassis—potted trans-

formers—wide spaced tuning capacitors—ceramic insulation—Illuminated VFO dial and meter face—remote control socket—preformed wiring harness—concentric control shafts—high quality, well rated components used throughout. Overall dimensions 20 1/4" wide x 13 1/4" high x 16" deep.

Supplied complete with all components, tubes, cabinet and detailed construction Manual. (Less crystals.) Don't be deceived by the low price! This is a top-quality transmitter designed to give you years of reliable service and dependable performance.

Heathkit AMATEUR TRANSMITTER KIT

Enjoy the trouble-free operation of commercially designed equipment while still benefiting from the economics and personal satisfaction of "building it yourself."

This CW Transmitter is complete with its own power supply, and covers 80, 40, 20, 15, 11 and 10 meters. Single knob bandswitching eliminates coil changing. Panel meter indicates grid or plate current for the final. Crystal operation, or can be excited by external VFO. Crystal not included in kit. Incorporates features one would not expect in this price range, such as key-click filter, line-quality components throughout. Instruction Book simplifies assembly. Uses 6AG7 oscillator, 6L6 final and 5U4G rectifier. Up to 35 watts plate power input.



MODEL AT-1

\$29⁵⁰

Shpg. Wt. 15 lbs.



Model GD-18

\$19⁵⁰

Shpg. Wt. 4 lbs.

Heathkit GRID DIP METER KIT

This is an extremely valuable tool for Hams, Engineers or Servicemen. Covering from 2 Mc to 250 Mc, it uses 500 μ a meter for indication. Kit includes prewound coils and rack. Will accomplish literally hundreds of jobs on all types of equipment.

Heathkit ANTENNA IMPEDANCE METER KIT

Use in conjunction with a signal source for measuring antenna impedance, line matching purposes, etc. Will double, also, as a phone monitor or relative field strength indicator.

100 μ a meter employed. Covers the range from 0 to 600 ohms. An instrument of many uses for the amateur.



Model AM-1

\$14⁵⁰

Shpg. Wt. 2 lbs.

Heathkit VFO KIT



MODEL VF-1

\$19⁵⁰

Shpg. Wt. 7 lbs.

Weigh the cost of this kit against the cost of crystals—and consider the convenience and flexibility of VFO operation. This is one of the most outstanding kits we have ever offered for the radio amateur.

Covers 160—80—40—20—15—11 and 10 meters with three basic oscillator frequencies. Illuminated and precalibrated dial scale clearly indicates frequency on all bands and provides more than two feet of dial calibration. Reflects quality design in the use of ceramic coil forms and tuning capacitor insulation, and copper plated chassis. Simply plugs into crystal socket of any modern transmitter to provide coverage of the bands from 160 meters through 10 meters. Uses 6AU6 Clapp oscillator, and OA2 voltage regulator for stability. May be powered from plug on Heathkit Model AT-1 Transmitter, or supplied with power from most transmitters.



Model AC-1

\$14⁵⁰

Shpg. Wt. 4 lbs.

Heathkit ANTENNA COUPLER KIT

Poor matching allows valuable communications energy to be lost. The Model AC-1 will match your low power transmitter to an end-fed long wire antenna. Also attenuates signals above 36 Mc, reducing TVI. 62 ohm coaxial input—power up to 75 watts—10 through 80 meters.

Heathkit COMMUNICATIONS RECEIVER KIT

Covers 550 Kc to 35 Mc in 4 bands. Features electrical bandspread—separate R.F. and A.F. gain controls—noise limiter—AGC—BFO—phone jack—5 1/4" FM speaker.

CABINET: Fabric covered plywood cabinet. Part No. 91-10. Shpg. Wt. 5 lbs. \$4.50



Model AR-2

\$25⁵⁰

Shpg. Wt. 12 lbs. (Less Cabinet)

HEATH Company
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BENTON HARBOR 15, MICHIGAN



AMPLIFIER

Main amplifier and power supply each have their separate chassis for flexibility of installation. Features the Acromound "ultra-linear" output transformer. Power output is over

Frequency response cps to 100,000 cps. Power supply to 100 watts.

COMBINATIONS

Amplifier and power supply to 100 watts, component

\$49

W-3M: Consists of main and separate construction. Includes an and complete assembly instructions. Ship. Wt. 29 lbs., Exp. Only . . .

W-3: Consists of W-3M Kit listed above plus Heathkit Model WA-12 Promodifier. Ship. Wt. 27 lbs., Exp. Only . . .

\$69.50



\$15.50

Shpg. Wt. 10 lbs.

Model A-7B: although not classified as a true high fidelity amplifier, this Heathkit Amplifier provides full 6 watts power output, more than adequate for normal home installation, and frequency characteristics are $\pm 1\frac{1}{2}$ db from 20 to 20,000 cps. Push-pull output—dualized construction—manual-top-quality parts. Output transformer tapped at 4, 8, and 15 ohms. Bass and treble tone controls provided. Two input channels.

MODEL A-7C: Same as Model A-7B except with preamplifier stage. Shpg. Wt. 10 lbs., \$17.50.

This advanced-design 25 watt Hi-Fi Amplifier features a new-design Powerless output transformer, improved circuitry, and uses KT-66 output tubes. This results in higher power output, improved bass and high frequency response; and reduced IM and harmonic distortion. Incorporates all the "extra" features that make for real listening enjoyment. Power handling capabilities increased to follow instantaneous power peak of full orchestra. Also new type balancing circuit, and "tweeter saver" to suppress HF oscillation. New physical design results in attractive appearance, suitable for use either in or out of a cabinet.



W-338: Consists of main amplifier and power supply for single chassis construction. Includes all tubes, components, and complete assembly instructions. **55Q75**

Shpg. Wt. 31 lbs., Exp. Only **\$5975**
W-8: Consists of W-5M Kit listed above plus Healthkit
 Model WA-P2 Pre-amplifier. Shpg. Wt. 28 lbs., Exp. Only **\$7950**

This is the lowest priced Williamson-type Amplifier ever offered in kit form. Main amplifier and power supply on a single chassis. Features Chicago output transformer. Flat within ± 1 db from 10 cps to 100,000 cps. Maximum power output over 20 watts.

W-401: Consists of main amplifier and power supply for single chassis construction. Includes all tubes, components, and complete assembly instructions. Ship. Wt. 35 lbs., Exp. Only **\$139.75**

W-4: Consists of W-401 kit listed above plus Heathkit Model WA-12 Pre-amplifier. Ship. Wt. 35 lbs., Exp. Only **\$159.50**

Model A-98

\$3550

Shpg. Wt.
23 lbs.

Shpg. wt.
23 lbs.

Here is your least expensive route to real high fidelity performance. Full 20 watt output—separate bass and treble tone controls—frequency response ± 1 db 20-20,000 cps—four switch-selected, compensated inputs—low hum and noise level—output transformer tapped at 4, 8, 16, and 500 ohms. Single chassis construction combines preamplifier, main amplifier, and power supply in one unit.

Model WA-P2

\$1975

Shpg. Wt. 7 lbs.

Beautiful

modern appearance
blends with any

Interior color scheme.

Completely fulfills all the requirements for remote control, compensation, and preamplification for the Heathkit Williamson-type Amplifiers or any conventional Hi-Fi Amplifier. Five separate input channels, each with separate audio level control. Full record equalization accomplished with 4-position turnover and roll-off controls.

Separate bass and treble controls. Overall frequency response within 1 db from 25 cps to 30,000 cps. Hum and noise level extremely low. This brilliant performer will do justice to the finest available program sources.

HEATH COMPANY • Benton Harbor 15, Mich.

ORDER BLANK

MAIL YOUR ORDER
TODAY TO THE
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A SUBSIDIARY OF DAYSTROM INC.
BENTON HARBOR 15,
MICHIGAN

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☐ Freight
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"Superb Performance!"

—HIGH FIDELITY Magazine

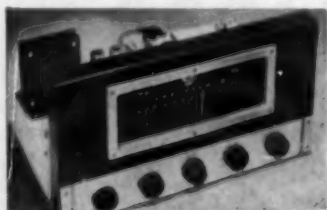
THE FISHER

SERIES SEVENTY

"HIGH QUALITY results at an attractive price," says *High Fidelity Magazine*. The SERIES SEVENTY tuner and amplifier have established themselves firmly as the outstanding buy in the professional quality field. The performance of this equipment is limited only by the calibre of the phonograph pickup, turntable and loudspeaker system used in conjunction with it.

THE FISHER FM-AM Tuner • Model 70-RT

■ Features *extreme sensitivity* (1.5 mv for 20 db of quieting); works where others fail. Armstrong system, *adjustable AFC* on switch, *adjustable AM selectivity*, separate FM and AM front ends. Shielded and shock-mounted main and subchassis. Distortion below 0.04% for 1 volt output. Hum level: better than 90 db below 2 volts on radio, better than 62 db below 10 mv input on phono. 2 inputs. 2 cathode-follower outputs. Self-powered. Exceptional phono preamplifier with full equalization facilities. 15 tubes. Six controls: Bass, Treble, Volume, Channel/Phono Equalization, Tuning and Loudness Balance. Beautiful control panel. SIZE: 14 1/4" wide, 8 1/2" high, 9 1/4" deep.



\$184.50

THE FISHER 25-Watt Amplifier • Model 70-AZ

■ Offers more *clean watts* per dollar at its price than any amplifier made. The 70-AZ has *2 1/2 times the power* of 'basic' 10-watt units. **OUTSTANDING FEATURES:** High output (less than 1/2% distortion at 25 watts; 0.05% at 10 watts.) IM distortion less than 0.5% at 20 watts; 0.2% at 10 watts. Uniform response ± 0.1 db, 20-20,000 cycles; 1 db, 10-50,000 cycles. Power output constant within 1 db at 25 watts, 15-35,000 cycles. Hum and noise virtually non-measurable (better than 95 db below full output!) Includes FISHER Z-MATIC at no additional cost. SIZE: 4 1/4" x 14 1/4" x 6 1/4" high.



\$99.50

Prices Slightly Higher West of the Rockies

WRITE TODAY FOR COMPLETE SPECIFICATIONS

FISHER RADIO CORP. • 21-23 44th DRIVE • L. I. CITY 1, N. Y.



E-V "SKYLARK"

Electro-Voice, Inc., of Buchanan, Mich., has recently introduced a complete three-way loudspeaker system which is housed in an attractive, compact cabinet designed to be placed on a table, in a bookcase, or on the wall.

Tradenamed the "Skylark", the cabinet measures 33" wide, 14" high, and 10 1/4" deep. It incorporates two tapered horn ports which load the SP8C



low-frequency and mid-range reproducer from 70 to 3500 cps. The company's T35B very-high-frequency tweeter takes over at 3500 cps to beyond audibility.

Currently available in mahogany and Korina blonde finishes, the new system covers from approximately 70 cps to 15,000 cps, ± 6 db. Complete electrical and mechanical specifications on this system are included in Bulletin No. 219, which is available from the company on request.

LOW-COST FM TUNER

Granco Products Inc., 36-17 20th Avenue, Long Island City 5, N. Y., has added a second low-cost FM tuner to its "Music Hall" series.

The Model T-160 features a "paragrid" front panel which incorporates a neat slide-rule tuning dial and two control knobs. The built-in antenna eliminates installation problems.

The circuit features the company's coaxial tuner, five tubes plus selenium rectifier power supply, for a sensitivity of 5 μ v. for 20 db. quieting. The selectivity of 200 kc. at 6 db points, with ratio detector peak-to-peak separation of 300 kc. and linear detector response for 180 kc., minimizes any possible interference.

Dimensions are 7 1/4" wide, 5" high, and 4 1/4" deep. The tuner weighs 5 pounds.

MODERN BAFFLE

Lowell Manufacturing Co., 3030 La-clede Station Road, St. Louis 17, Mo., is now offering a new, modernly-con-

RADIO & TELEVISION NEWS

toured baffle which is constructed of a series of attractive louvres with an exclusive conical sound diffuser to provide controlled 360-degree dispersion of even, undistorted low-level sound.

The STL baffle is specifically designed for low-ceilinged areas such as restaurants, offices, schools, railway cars, and wired music installations where attractive decor, speaker concealment, and high audio efficiency are requisites.

The baffle will accommodate 6" to 12" speakers and mount to a variety of the company's recessed protective speaker enclosures. The unit is available with a buffed satin aluminum finish or colored lacquer finishes can be supplied if desired.

AUDIO-MASTER ITEMS

Audio-Master Corp., 17 E. 45th Street, New York, N. Y., is now offering several new items to the audio trade.

The firm's standard all-purpose transcription playback machine has been redesigned to permit front-panel operation. The new style offers operational advantages which are especially important in the audio-visual field. The newly-redesigned units incorporate 5-tube push-pull high gain amplifiers, three speed motors, and will handle records and transcriptions up to 17½ inches in diameter.

The other items include two new hi-fi machines: a portable transcription playback machine (Model A-M #58) and an automatic record changer. Full details on both of these units and on the newly-redesigned transcription playback machines are available from the company on request.

3-SPEED TAPE RECORDER

Bell Sound Systems, Inc., 555 Marion Road, Columbus 7, Ohio, has recently introduced an all-new, three-speed tape recorder, the Model RT-75.

The RT-75 features full push-button control with straight-line slot threading. A positive-action lever permits selection of the three tape speeds, 7½ ips, 3¾ ips, or 1½ ips. Frequency re-



sponse at 7½ is rated at 30 to 12,000 cps; 7500 cps at 3¾ ips; and 4500 cps at 1½ ips.

The recorder features exceptionally fast forward and rewind speeds. A standard 1200-foot spool can be re-wound in 70 seconds. Controls include volume, tone boost and cut, and push-

"Dream Set!"

—LIFE Magazine

THE FISHER

SERIES FIFTY

THE FISHER FM-AM Tuner • Model 50-R



■ "This tuner is among the most sensitive of all in 'fringe' areas and conjoins beautifully with the FISHER Amplifier."—*Life Magazine*. The truest index to the quality of the Model 50-R is its selection even by FM stations, after competitive trials, for pickup of distant programs for rebroadcast to their own communities. In town, or even in the extreme suburbs, the 50-R is unexcelled. **\$164.50**

THE FISHER Master Audio Control • Series 50-C



■ "The finest unit yet offered."—*Radio and TV News*. 25 choices of record equalization, outstanding phono preamplifier, separate bass and treble tone controls, loudness balance control, 5 inputs and 5 input level controls, cathode follower outputs. Hum and noise inaudible.

Chassis **\$89.50**
With cabinet **\$97.50**

THE FISHER 50-Watt Amplifier • Model 50-AZ



■ "Of the very best!"—*High Fidelity Magazine*. Will handle 100 watts peak. World's finest all-triode amplifier. Uniform response within 1 db from 5 to 100,000 cycles. Less than 1% distortion at 50 watts. Hum and noise content 96 db below full output—virtually non-measurable! Oversize components and quality workmanship in every detail. Includes FISHER Z-MATIC, at no additional cost. **\$159.50**

Prices Slightly Higher West of the Rockies

WRITE TODAY FOR COMPLETE SPECIFICATIONS

FISHER RADIO CORP. • 21-23 44th DRIVE • L. I. CITY 1, N. Y.

Fine Accessories

FOR THE FULLEST ENJOYMENT
OF YOUR HOME MUSIC SYSTEM

FISHER ACCESSORIES



MIXER-FADER • Model 50-M

NEW! Electronic mixing or fading of any two signal sources (such as microphone, phono, radio, etc.) No insertion loss. Extremely low hum and noise level. High impedance input; cathode follower output. 12AX7 tube. Self-powered. Beautiful plastic cabinet. **Only \$19.95**



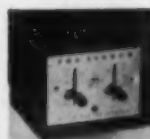
PREAMPLIFIER-EQUALIZER • 50-PR

Professional phono equalization. Separate switches for HF roll-off and LF turn-over; 16 combinations. Handles any magnetic cartridge. Extremely low hum. Uniform response, 20 to 20,000 cycles. Two triode stages. Fully shielded. Beautiful cabinet. Self-powered. **\$22.95**



PREAMPLIFIER-EQUALIZER • 50-PR-C WITH VOLUME CONTROL

50-PR-C. This unit is identical to the 50-PR but is equipped with a volume control to eliminate the need for a separate audio control chassis. It can be connected directly to a basic power amplifier and is perfect for a high quality phonograph at the lowest possible cost. **\$23.95**



HI-LO FILTER SYSTEM • Model 50-F

Electronic, *sharp cut-off* filter system for suppression of turntable rumble, record scratch and high frequency distortion — with *absolute minimum* loss of tonal range. Independent switches for high and low frequency cut-off. Use with any tuner, amplifier, etc. **\$29.95**



PREAMPLIFIER • Model PR-5

A self-powered unit of excellent quality, yet moderate cost. Can be used with any low-level magnetic cartridge, or as a microphone preamplifier. Two triode stages. High gain. Exclusive feedback circuit permits long output leads. Fully shielded. Uniform response, 20 to 20,000 cycles. The best unit of its type available. **\$12.57**

QUALITY IS NO ACCIDENT...

At Fisher Radio Corporation we never take chances with quality. All materials go first to the Incoming Inspection Department and any that do not meet our rigid requirements are returned to their manufacturer. In addition, inspection occurs at many points during production—from the original, blank chassis to the final, assembled unit, assuring correct assembly and wiring. Our Test Department is staffed with a highly-trained group of technicians. Finally, equipment *already packed for shipment* is selected at random and given a complete inspection and electrical test in our Engineering Laboratories to keep Quality Control at a constant, high level.

WRITE TODAY FOR COMPLETE SPECIFICATIONS

FISHER RADIO CORP. • 21-23 44th DRIVE • L. I. CITY 1, N. Y.

button recording control with safety interlock to prevent accidental erasure. Two microphone inputs are provided in addition to one radio-phono-TV input.

Write to H. H. Seay, general sales manager of the firm, for full details.

MASCO TAPE RECORDER

Mark Simpson Manufacturing Co., 32-28 49th Street, Long Island City, N. Y., recently introduced a new tape recorder for home and semi-professional use, the Model 500.

The new Masco recorder has a single shift knob. It is housed in a luggage-



type leatherette carrying case in an ivory and gold motif. The instrument is a dual speed-dual track recorder which takes up to 7" reels. Frequency response is 50 to 12,000 cps ± 3 db. Audio power output is 5 watts. A specially-designed 5" x 7" oval speaker is used.

The recorder weighs only 23 pounds with all accessories. These include the 7" reel with 600 feet of tape, an empty take-up reel, a ceramic microphone styled to match the recorder, 10 feet of cable, and a patchcord.

PRE-RECORDED TAPES

Electrosonic Specialties, 7230 Clinton Road, Upper Darby 4, Pa., has announced the availability of a series of pre-recorded background music tapes which will be sold direct to the consumer, under the tradename "Fidelivox".

The currently-available tapes feature Robert Elmore playing a cathedral pipe organ. The tapes are being issued in 2, 4, 6, and 8 hour sections, dual-track. Write the company for full information on the selections and prices of these tapes.

NEW KNIGHT UNITS

Allied Radio Corporation, 100 N. Western Avenue, Chicago 80, Ill., has added two new units to its line of "Knight" audio gear.

The "Knight Bantam" unit is a 12-watt amplifier which is housed in a black and gold finished metal case, ready for use on table top, bookshelf, or mantel. Provisions for behind-panel mounting in custom installations are included. The amplifier measures only 3½" x 13" x 10¼". Frequency response at 12 watts output is ± 5 db from 20

RADIO & TELEVISION NEWS

to 20,000 cps. Harmonic distortion is less than 1 per-cent at rated output and intermodulation distortion is less than 2 per-cent at the rated output.

The second unit is a self-powered preamp-equalizer which is designed to serve as a convenient control center for hi-fi music systems or for modernization of existing phono equipment.

It includes separate bass and treble controls, calibrated from -16 db to +16 db to permit adjustment of tonal balance to satisfy personal tastes and to match room acoustics. Five input jacks accommodate all components normally used in a music system. A six-position input selector switch selects these components and provides three positions of record compensation: *ffrr*, RIAA, and "Hicut" for old, noisy records.

Detailed literature on both of these units is available from the company on request.

DISC RECORDER

Excellotone Corporation, 129 Cooper Street, Brooklyn, N. Y., is now in production on a new disc recorder which will record and play at 33 1/3 rpm.

The cased, portable unit measures 9" x 12" x 9" and weighs just 16 pounds. It is suitable for home, business, or professional use and may also function as a p.a. system.

The inexpensive, pliable "Exelodisks" are made of pure vinyl, five inches in diameter. They play for 30 minutes. These discs can be stored in



the case of the recorder itself. The unit features a minimum of controls and simplicity of operation.

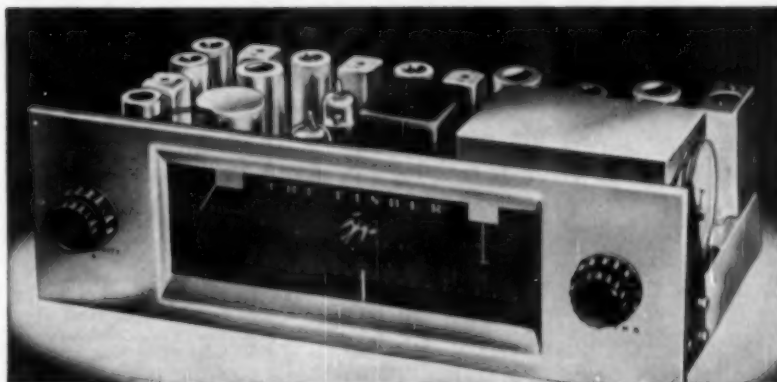
JIM LANSING SPEAKER

James B. Lansing Sound, Inc., 2439 Fletcher Drive, Los Angeles 39, Calif., has added the "Signature Model 123" to its line of loudspeaker units.

The new speaker is a 12" extended-range type which is compact enough to mount in enclosures which previously required a unit of smaller diameter. With a depth of only 3 1/2", the new speaker can be mounted between studing, flush with the surface of any standard wall or partition. The Model 123 is not limited to wall mounting since, according to the company, performance improves when the speaker is enclosed in a reflex cabinet or loaded with a horn.

Usable frequency response range, when used as a direct radiator and en-

June, 1955



America's TOP Tuner!

THE FISHER

FM TUNER MODEL FM-80

World's Best by LAB Standards

FOR almost two decades we have been producing audio equipment of outstanding quality for the connoisseur and professional user. In the cavalcade of FISHER products, some have proved to be years ahead of the industry. THE FISHER FM-80 is just such a product. Equipped with TWO meters, it will outperform any existing FM Tuner *regardless of price!* The FM-80 combines extreme sensitivity, flexibility and micro-accurate tuning. Despite its full complement of tubes and components, the FM-80 features an unusually compact chassis of fine design. **Only \$139.50**

Outstanding Features of THE FISHER FM-80

- TWO meters; one to indicate sensitivity, one to indicate center-of-channel for micro-accurate tuning. • Armstrong system, with two IF stages, dual limiters and a cascade RF stage. • Full limiting even on signals as weak as one microvolt. • Dual antenna inputs: 72 ohms and 300 ohms balanced (exclusive!). • Sensitivity: 1 1/2 microvolts for 20 db of quieting on 72-ohm input; 3 microvolts for 20 db of quieting on 300-ohm input. • Chassis completely shielded and shock-mounted, including tuning condenser, to eliminate microphonics, and noise from otherwise accumulated dust. • Three controls — Variable AFC/Line-Switch, Sensitivity, and Station Selector PLUS an exclusive Output Level Control. • Two bridged outputs. Low-impedance, cathode-follower type, permitting output leads up to 200 feet. • 11 tubes. • Dipole antenna supplied. Beautiful, brushed-brass front panel. • Self-powered. • WEIGHT: 15 pounds. • SIZE: 12 3/4" wide, 4" high, 8 1/4" deep including control knobs.

Price Slightly Higher West of the Rockies

WRITE TODAY FOR COMPLETE SPECIFICATIONS

FISHER RADIO CORP. • 21-23 44th DRIVE • L. I. CITY 1, N. Y.

PRE-VACATION \$1 SALE!



JUNE ONLY BONUS!
YOUR CHOICE OF
ANY KIT BELOW
FREE!
WITH EVERY \$10 ORDER

ELECTRONIC
KITS
AND OTHER BARGAINS

50 CERAMIC CONDENSERS. Several tubular, disc, button types. Over 20 values. 2 to 1000mmf. Shop must! Wt. 1 lb. Reg. \$13. **\$1**
50 TUBULAR CONDENSERS. 50 types, 500 pF to 1000V. Reg. \$10. **\$1**
25 OIL CAPACITORS. Bechtel and tubular. 1 to 2nd up to 1000V. Well-known mfrs. Wt. 4 lbs. Reg. \$17. **\$1**
10 ELECTROLYTICS. Tubular and PP units. 8 to 1000mmf. up to 400V. Many multiple sections. Wt. 2 lbs. Reg. \$11. **\$1**
50 RF COILS, CHOKES and elongated coils for TV, radio, lab. 50 types. Wt. 1 lb. Reg. \$15. **\$1**
50 RESISTORS. 50 ohms to 50 meg. 1/4 and 1/2 watt. 25 selected values. Many 500. Insulated. Wt. 1 lb. Reg. \$12. **\$1**
50 PILOT LITE SOCKETS. Builders' special! Screw and bayonet bases. Wt. 2 lbs. Reg. \$6. **\$1**
1000 PIECES SPAGHETTI tubing, lengths to 4' 10 sizes. Fiberglass, cambric, plastic. Reg. \$7. **\$1**

20 W.W. RESISTORS. Power, standard and "dummy" types. 5 to 10000 ohms, 5 to 50 watts. 15 values. Wt. 2 lbs. Reg. \$11. **\$1**
10 RADIO CHASSIS. 5, 6 & 7 tube punched chassis. New! Workable, must! Wt. 2 lbs. Reg. \$8.50. **\$1**
75 KNOBS. Same worth and on. For auto, radio, 15 types, push-on, not screw. Wt. 2 lbs. Reg. \$8.50. **\$1**
THREE LBS. HARDWARE. Assorted. Over 1000 pieces, screws, nuts, washers, etc. Reg. \$8.50. **\$1**
18 CORTOLLS. Up to 1 meg. 12 selected values. Some w/ switch, some dual. For TV, radio. Wt. 2 lbs. Reg. \$12. **\$1**
TEN 20-FT. ROLLS WIRE. Plastic and cloth insulated, solid & stranded. 24 to 26, acid, mfrs. Wt. 2 lbs. Reg. \$5.50. **\$1**
15 SWITCHES. Rotary, push, micro, toggle. Supercenters must! Wt. 2 lbs. Reg. \$12. **\$1**
25 YUSE SOCKETS. Molded w/fer, shield base types. 4 to 5 pin. 10 sizes, some ceramic and mica. Wt. 6 lbs. Reg. \$8.50. **\$1**
200 COIL FORMS. 50 sizes and shapes. Bakelite and ceramic. P-serpenters must! Wt. 2 lbs. Reg. \$14. **\$1**

TV ACCESSORY KIT. Never before! 1 each 60 & 70 degree tubes, focus coil. Brand new! Wt. 6 lbs. Reg. \$10. **\$1**
M/C ASSEMBLY. Exclusive Mid. on form, strips. To mounted, paper and mica capacitors. 00001 to 47 mf up to 500V. 45 low resistors. Leads 1/4" to 1" long. Brand new. Wt. 2 lbs. Reg. \$15. **\$1**
50 MICA CAPACITORS. Here bargain! Postage stamp type. 00001 to .01 mf. Many silver 500. 20 values. Wt. 1 lb. Reg. \$17. **\$1**
BULGED CAPACITORS. Outstanding value! 20 selected sizes. 0005 to .05 mf up to 600V. Reg. \$13. **\$1**
25 VARIABLES. First time in U.S. 2 values mica and ceramic trimmer capacitors by Erie and Elmore; from 3-12 to 5000 mmf. Single and dual. Wt. 1 lb. Reg. \$16. **\$1**
10 INDICATORS & HOLDERS. A Laktron first! 5 pilot lite and thermal indicators. 5 Little-Lite voltmeters. Wt. 1 lb. Reg. \$8. **\$1**
70 TERM. POSTS & STRIPS. Built on special post, binding posts, screw and lug type terminal strips (1 to 10 terms.). Wt. 1 lb. Reg. \$4.50. **\$1**

SCOOP! 20-MIN. PHOTO-TIMER

Once in a lifetime purchase! 0 to 20 minute spring-wound timers. For photo dark rooms, home and factory use. Rings bell when timing cycle ends and attached microswitch opens circuit. Wt. 2 lbs.

REG. \$5.50

\$1.69



PHOTO DARK-ROOM TRAYS

Sturdy glass dark room trays with 1/8" thick bottom. 9 x 13 1/2" or 10 x 14 1/2". Wt. 6 lbs. Reg. \$3.50.

88¢

Please send check or Money Order. Include postage. C.O.D. orders, 25% down payment.

LEKTRON SPECIALTIES

Meter Buy of the Year

Marion 2" rectangular meter. Brand new! Measures 0-10 V DC. Movement 10 ms. Has special scale. Wt. 2 lbs.

Reg. \$8.50. **\$1.88**

Pre-Amp Power Xfmr

For GE and other pre-amps. In: 115/60. Out: 150 V @ 15 ma; 6.3 @ 0.6A; 30 V @ 25 ma. Wire leads. Wt. 1 lb. Reg. \$3.50.

88¢

PERFORMANCE

Guaranteed

TO LAST A LIFETIME!

UNIVERSITY COBREFLEX-2 WIDE-ANGLE TRUMPET

Lifetime Performance has been built into each Cobreflex-2. Nothing yet produced compares in construction and design efficiency. Once installed, the Cobreflex-2 can be forgotten. The Cobreflex-2 is Breakdown-Proof... truly performance guaranteed to last a lifetime.

Compared! Tested! Proven Superior!

Write for technical literature



Desk No. 82

When used with University Driver Units
Meets Any:
Frequency Response
Power Capacity
Impedance Requirement
Mounting
Application



Model T-30 Driver Unit
Cont. Power: 30 Watts
Sensitivity: 90-10,000 CPS
Impedance: 8 Ohms

Model SA-30 Driver Unit
Cont. Power: 30 Watts
Sensitivity: 90-10,000 CPS
Impedance: 16 Ohms

Model MA-30 Driver Unit
Cont. Power: 30 Watts
Sensitivity: 90-10,000 CPS
Impedance: 16 Ohms

Model PA-30 Driver Unit
Cont. Power: 30 Watts
Sensitivity: 90-10,000 CPS
Impedance: 16/145/700/500/1000/2000 Ohms
Power Type (TYP): 50/20/10/5/2.5 Watts

Model SA-50 Driver Unit
Cont. Power: 30 Watts
Sensitivity: 90-10,000 CPS
Impedance: 11.6/11.6/145/200/500/1000/2000 Ohms
Power Type (TYP): 50/20/10/5/2.5 Watts

UNIVERSITY LOUDSPEAKERS INC.

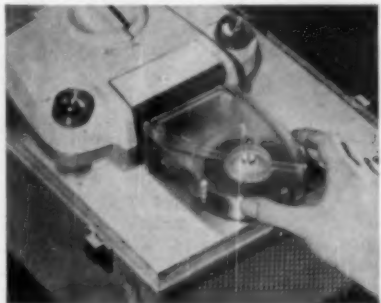
80 South Kensico

White Plains, N.Y.

closed with an adequate baffle, extends from 30 to 15,000 cps. Power input is 20 watts and impedance is 16 ohms.

TAPE MAGAZINE

A new clip-in tape magazine that eliminates objectionable threading and



rewinding of magnetic recording tape has been developed by American Molded Products of Chicago.

Fully enclosed in the magazine, the tape is locked into playing position with slight finger pressure. The magazine is automatically ejected from the machine when the control knob is turned to "eject".

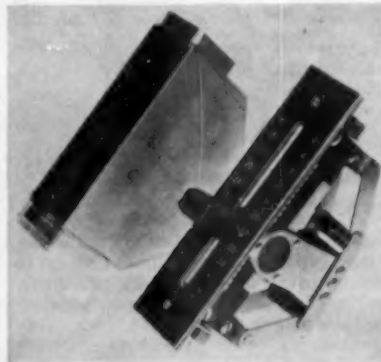
Storage space problems are greatly simplified since over-all dimensions of the entire unit are only 3 1/2" x 5 1/2" x 1". The tape itself is 300 feet long and reels in counterclockwise direction. At the end of the 300 foot span a Mobius loop arrangement automatically transfers playback or recording to the opposite side, thus providing an actual length of 600 feet.

Full details are available from Dept. REN of the company at 2727 W. Chicago Avenue, Chicago 22, Ill.

VERTICAL ATTENUATOR

A new low-cost vertical attenuator covering the audio range has been developed by Tech Laboratories, Inc., 8 E. Edsall, Palisades Park, N. J.

The new attenuator has straight-line, finger-tip operation, accomplished



without any guide rods through the use of a new linkage system that completely eliminates backlash or stickiness, minimizing wear and extending the life of the unit.

Both plug-in and fixed-panel designs are currently available. Standard units are furnished in two sizes of 30 and 20

RADIO & TELEVISION NEWS

steps, 30 step units at 1.5 db and 20 step units at 2 db. Ladder, "T," or potentiometer circuits are standard with impedance values for ladders ranging from 30 to 600 ohms and 250,000 ohms for potentiometers.

Complete information is available from the company on request.

REVERE RECORDER

Revere Camera Company of Chicago has just introduced its T-11 tape recorder which is designed especially for professional and custom applications.

Frequency response is 40 to 16,000 cps, ± 3 db. The unit has a monitor amplifier with $2\frac{1}{2}$ watts output. Wow and flutter is less than .2 per-cent. Among the patented features included in this new recorder are the firm's "Balanced-Tone" principle which coordinates the amplifier and acoustic system to balance the highs and lows;



automatic head demagnetization; and rapid individual forward and reverse. Solenoid-operated keyboard push-buttons make it possible for untrained personnel to use the unit. The T-11 accepts 3, 5, 7, and $10\frac{1}{2}$ inch reels. It may be mounted and operated in any position.

NEW SPEAKER DESIGN

Stephens Manufacturing Corporation, 8538 Warner Drive, Culver City, Calif., has announced that the free air resonance of its 120LX "Tru-Sonic" low-frequency driver has been lowered by the use of a new cone. The new cone, which is a straight-sided, ribbed cone of low resonance, has cut the free air resonance of the speaker to 45 cps. This results in improved bass response, with lows of 20 cps when the speaker is properly housed, according to the company.

Other features of the 120LX woofer remain the same.

SINGLE NEEDLE CARTRIDGE

Ronette Acoustical Corporation, 135 Front St., New York 5, N. Y., is in production on a series of single-needle "Fonofluid" cartridges for microgroove reproduction exclusively.

The Type RA-284 has low IM distortion and is of the constant-velocity type when loaded with the correct load resistance of 120,000 ohms.

Available with sapphire or diamond styli, full details on this new cartridge line are available from the manufacturer.

June, 1955

H. H. Scott

AWARD WINNING AUDIO COMPONENTS

310 FM BROADCAST MONITOR TUNER — Most important new development in tuner design — 2-megacycle wide-band circuitry for outstanding reception quality even on weak signals. Convenient single-sweep tuning. DYNAURAL interstation noise suppressor. Automatic gain control. Tuning and signal-strength meter. Three IF's, three limiters. Sensitivity: 2 microvolts with 20 db quieting. Capture ratio better than 2.5 db. \$149.50* net



718A STROBOSCOPIC TURNTABLE — Radically new torsional and dual-stage mechanical filtering reduces rumble by more than 60 db, "wow" to less than 0.1%. Built-in optical stroboscope visible with record in place. Push-button selection of 33 $\frac{1}{3}$, 45, and 78 rpm speeds. Each speed vernier adjustable $\pm 5\%$ for pitch control. Acoustic feedback eliminated by a basic new pickup-arm mounting. \$102.00* net, Optional base \$14.95* net.

121-A DYNAURAL Equalizer-Preamplifier — The most versatile control and compensation unit ever offered, the 121 affords the music connoisseur adjustment for any recording curve and record quality. Patented DYNAURAL noise suppressor and record-distortion filter. Roll-off equalization, turn-over frequency, and maximum "boost" continuously variable. The 121 incorporates all refinements known at this stage of the art. \$162.75* net



285-A 70-watt LABORATORY POWER AMPLIFIER — A distinguished amplifier for the perfectionist. Exclusive adjustable "Dynamic Power Monitor" control allows full output on music, with maximum speaker protection. Damping factor continuously adjustable from 30/1 to 0.5/1. Class A circuitry throughout. Frequency response flat from 12 cps to 80,000 cps. Intermodulation distortion less than 0.1%, harmonic distortion less than 0.5% at full output. \$200.00* net.

210-C 23-watt COMPLETE AMPLIFIER — Incorporating the best features developed by H. H. Scott, the 210-C offers an outstanding combination of styling, performance and price. Patented DYNAURAL noise suppressor, 8-position equalizer, three-channel tone controls, Loudness control, and provision for convenient tape recording. Flat from 19 to 35,000 cps. Intermodulation distortion less than 0.1% at full output. \$172.50* net.



*Prices slightly higher west of Rockies. Prices and specifications subject to change without notice.

Engineering Leadership
for Superior Performance

H. H. SCOTT inc.

385 PUTNAM AVENUE
CAMBRIDGE, MASSACHUSETTS

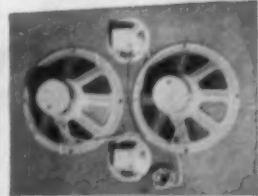
Professional recognition includes:

- "Electrical Manufacturing" Award for outstanding laboratory instrument design
- The Audio Engineering Society's award of the John H. Potts memorial medal to H. H. Scott for outstanding contributions to audio science
- H. H. Scott amplifiers were rated "first choice" in the "Saturday Review Home Book of Recorded Music and Sound Reproduction."

Write for
FREE BOOKLET R55-6

NEW IMPERIAL IV HIGH FIDELITY SPEAKER—SALE PRICE \$19.95

25 WATT HI-FI SPEAKERS AND BAFFLE BOARD



Cover for attenuating highs and augmenting low frequency response. Variable control. Sale price, \$34.95.

2—12" WOOFERS
2—5" TWEETERS
AND BAFFLE

\$24.95

350 CYCLE Crossover \$10.00 Extra

Stock No. 4P-55, four speakers mounted on a 34" plywood baffle board 31 1/2" x 28 1/2" long. For mounting in your present cabinet or wall-mounting. You save time and trouble of properly mounting and baffling. Equipped with 2—12" heavy magnet woofers and 2—5" tweeters. Response 50 to 15,000 cps. Works properly on any radio or amplifier with 3.2 or 8 ohm output. Ship. wt. 20 lbs. List value over \$40.00. Sale price, \$24.95.

**McGee's Famous
12 AND 15 INCH COAXIAL P.M.
HIGH FIDELITY SPEAKERS**

\$12.95 \$23.95

12-inch Model CU-14Y 15-inch Model P15-CR

Model CU-14Y, 12" high fidelity coaxial P.M. speaker. Response from 30 to 17,000 cps. Full 8 ohm Alnico V magnet in the 12" woofer. Special coaxially suspended high frequency tweeter. Built-in crossover network. Only two wires to connect to your radio or amplifier. Matches 3.2 to 8 ohm output. Don't confuse this speaker with many cheap speakers that are offered. This is a fine quality speaker. Stock No. CU-14Y. Sale price \$12.95 each, two for \$23.95.

Model P15-CR, 15" high fidelity coaxial P.M. speaker. Response down to 30 cps. and up to 17,000 cps. Full 8 ohm Alnico V magnet in the 15" woofer. Special coaxially suspended 8" high frequency tweeter. Built-in crossover network. Only two wires to connect. Matches 3.2 to 8 ohm output transformer. A regular \$62.50 list speaker. Model P15-CR, McGee's Sale Price, \$23.95.

SPECIAL PURCHASE SALE!

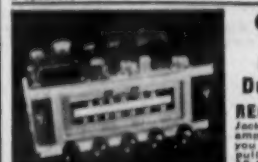


**CROSLY
FM-AM TUNER**

SALE PRICE \$19.99

AUDIO AMPLIFIER IS REQUIRED TO OPERATE A SPEAKER
Model 362-B, 6 tube Crosley FM-AM tuner. Receives broadcast, 550 to 1600 kc and FM, 88 to 108 mc. Uses loop antenna for broadcast and has external antenna connections for FM antenna. Complete with tubes: 3-6X6, 6BE6, 12AT7 and 6Y8. To operate this chassis is to be picked up from your present audio amplifier or television set. (4.5 volt filament and 195 to 180 volts at 30 ma. 110" voltages required.) Chassis size, 8 1/2" deep, 10 1/2" long, 5 1/2" high. Has illuminated slide rule dial 8 1/2" long and 1 1/2" high. 4 position twist on front of chassis selects FM, AM, TV or Stereo. A jack for variable reluctance pickup on back of chassis. One-half of the 6Y8 is used as a pre-amplifier for the variable reluctance input. Chassis has no volume control. Audio is fed into your television or high fidelity amplifier. These are new Crosley FM-AM tuners that cost the factory more than \$20.00 to build. Model 362-B, shipping weight 9 lbs. Sale price \$19.99. Complete with instruction, knobs, diagram, instructions and parts list.

Crosley 362-BVC, FM-AM tuner, same as above, but with volume control and power supply added to make a completely self-contained FM-AM tuner. Shipping weight 15 lbs. Sale price, \$24.99. Note: An audio amplifier is required to operate these tuners thru a speaker.



9-TUBE HI-FIDELITY

12 Watts Audio
Dual Tone Controls

\$39.95

RECEIVES BROADCAST 550 TO 1650 K.C.

Jackson Model 108A, 12 watt high fidelity audio amplifier and broadcast tuner combined, at less than you would normally pay for the amplifier alone. Push-pull 9V6 output. Frequency response from 30 to 18,000 cps. Input for crystal or G.E. variable reluctance pickup and crystal or dynamic microphone. Separate bass boost and treble tone controls. Radiophone switch on front of chassis. Shielded output transformer. Heavy duty 180 mill power transformer. 9 1/2" illuminated slide rule dial with etched glass scale. 3 gang condenser with tuned R.F. stage and loop antenna. Receives broadcast 550 to 1650 kc. Size 13" long, 6" high and 9 1/2" deep. Complete with tubes: 3-6X6, 6AL6, 6BE6, 6AV6, 6AT6, 6Y8 and 6Y9. Knobs, instruction, diagram and instructions included. Model 108A, Hi-Fi amplifier and tuner. Ship. wt. 9 lbs. Sale price, \$39.95. Model 108A with our CU-14Y 12" coaxial P.M. speaker, both for \$49.95. Model 108A with our P15-CR 15" coaxial P.M. speaker, both for \$59.95.

11-TUBE FM-AM HALLICRAFTERS



Regular \$89.50
McGEE'S SALE PRICE

\$69.95

★ HIGH FIDELITY

★ AUTOMATIC FREQUENCY CONTROL

Hallicrafters Model 5-76A, 11 tube FM-AM super-heterodyne chassis. Size 7 1/2" x 13 1/2" x 11" deep. Complete with tubes, knobs, instruction, diagram and instructions. Receives broadcast 540 to 1700 kc, plus FM 88 to 108 mc. AFC holds FM stations in perfect tune. Output transformer matches 3.2 ohm or 8 ohm high fidelity response. 50 to 14,000 cps. Bass boost tone control. A full 15 tube transformer powered chassis.

with push-pull 6X6 audio. This chassis found in 5400 to 5600 radio combinations. Has input for crystal phone pickup. Self-powered preamplifier necessary for G.E. variable reluctance cartridge. \$3.00 extra.

5-76A Hallicrafters 11 tube FM-AM chassis. Ship. wt. 22 lbs. \$69.95
5-76A Hallicrafters with our CU-14Y 12" coaxial P.M. speaker. \$79.95
5-76A Hallicrafters with our P15-CR 15" coaxial P.M. speaker. \$89.95

McGEE RADIO COMPANY

PRICES F.O.B. KANSAS CITY
SEND 25¢ OR FULL
REMITTANCE WITH ORDER.
BAL. DENT C.O.D.

NEW IMPERIAL IV with General Electric 8 in. HIGH FIDELITY SPEAKER

\$19.95

Now 1955 Model IMPERIAL IV, High Fidelity speaker system with General Electric 8" speaker. Housed in a high quality leatherette covered, plywood cabinet 10" x 10" x 10". Fully enclosed; covered on all sides except back. Use as an auxiliary speaker or as a main speaker for home music system. The IMPERIAL IV contains a General Electric Model 880 extended range high fidelity 8" PM speaker with 6.8 ohm Alnico V magnet and curvilinear cone with 8 ohm voice coil and a 5" tweeter. Response 50 to 15,000 cps. Model IV Imperial \$19.95.

CONSOLE HIGH FIDELITY SPEAKER SYSTEM

EQUIPPED WITH 3 PM SPEAKERS
12 IN. GENERAL ELECTRIC WOOFER
10 IN. MID RANGE SPEAKER
8 IN. GENERALIC MID-HIGH RANGE

\$49.95

Have John Deere tone quality in your own home. Strictly High Fidelity, this speaker system has a 500 cycle frequency dividing network, so that only 2 wires feed the system from any 4 or 8 ohm radio or amplifier. A variable tone compensating control incorporated in the circuit makes brilliant highs or boomy lows to your own taste. Any amplifier that you now have will give you a much wider selection of musical programs with this speaker system. The 3-way system is shipped ready to connect to your amplifier or radio. The General Electric 12" woofer, an 8" famous G.E. 880 plus a 10" middle range speaker. Frequency response 30 to 15,000 cps. Take your choice of cabinets: blonde oak, walnut or mahogany. (Specify finish desired when ordering) 37" high, 24" wide and 20" deep. Ship. wt. 75 lbs. Stock No. HF-336E, Sale price, \$49.95.



HIGH FIDELITY SPEAKERS

8" BLUE STREAK \$ 6.95

15" WOOFER \$16.95

Model HF-81, 8" "Blue Streak" High Fidelity wide range speaker. This one speaker properly baffled will give excellent response to both high and low frequencies and terrific response through the very important middle range. Has 6.8 ohm Alnico V magnet with wide range response essentially flat from 25 to 15,000 cps. Perfect for high fidelity radios, amplifiers and professional music systems. Ship. wt. 6 lbs. Model HF-81, Sale price, \$6.95.

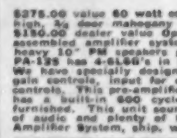
Model HF-15, 15" "Blue Streak" Hi-Fi woofer. Has a 14 1/2" ohm Alnico V magnet with curvilinear cone piece cone and 15 1/2" ohm voice coil. Will give good response from 30 to 5000 cps. Takes 15 to 50 watt peak. Ship. wt. 12 lbs. Sale price, \$16.95.



**60 WATT CONSOLE
AMPLIFIER
WITH 3 SPEAKERS**

\$169.50
\$275.00 VALUE

Model 60-W, 60 watt console auditorium amplifier system for only \$169.50. A 43" high, 45" deep mahogany console cabinet that cost \$400.00 to build, plus a regular \$150.00 dealer value Operadio brand watt auditorium amplifier. This is a complete assembled amplifier system with a super heavy duty 15" Operadio speaker and 2 8" speakers. 10" PM speaker and 8" tweeter. The 60 watt Operadio Model PA-155 has 4-6L6's in push-pull-parallel, driven by a 6BM7 with 2-6U4G rectifiers. We have specially designed a pre-amplifier that has two mixer inputs with separate gain controls, input for crystal or dynamic microphone and bass and treble tone controls. This pre-amplifier may be used in the cabinet or as a remote control. System has a built-in 500 cycle crossover network. Schematic diagram and instructions furnished. This unit sounds like a giant John Deere. A terrific value if you need lots of audio and plenty of bass response. Stock No. PA-258AS, 60 watt Auditorium Amplifier System, ship. wt. 130 lbs. Sale price, \$169.50.



3-STATION INTERCOM MASTER

SUB-STATIONS \$3.95 EACH

\$16.95

Powerful 3 station intercom master housed in a chrome plated metal cabinet 7 1/2" x 6" x 8". Full 3 tube amplifier for AC-DC operation. Push-to-talk switch on top of cabinet. Volume control, on-off switch and station selector are located on either side. May be used with one to three sub-stations. Master is quiet except when talk-back switch is pressed, or when call-back switch is pressed at the sub. Ship. wt. 10 lbs. Model MPB-A3, 3 station master, \$16.95. Matching sub-station, Model PM-A3, complete with 6" Alnico V PM speaker and call-back switch, \$3.95 each or 3 for \$10.00. Requires 3 wire intercom cable, \$1.95 per 100 ft., \$50 ft. for \$9.95.

GARRARD-COLLARO-WEBCOR

3-SPEED RECORD CHANGERS

\$65.00 LIST COLLARO 3/532 \$38.95

Here are top values in modern up-to-date 3 speed automatic record changers. New Webcor Model 114-43, 3 speed automatic changer with RPK-050 G.E. cartridge. Size 13 1/2" x 12" x 12". Ship. wt. 13 lbs. Sale price only \$29.95.

Regular \$65.00 list Collaro Model 3/532, 3 speed automatic record changer made in England. Internals 10 and 12 records of same speed. Constant speed 4 pole motor and weighted turntable with milled rubber pellet. Compensating spring to shift weight of tone arm for LP and 45. Record head will hold any popular cartridge. 14 1/2" long, 13 1/2" wide and 4 1/2" above motor board. 3 1/2" below. Available in grey, cream and gold hammer-tone. Ship. wt. 30 lbs. Regular net, \$64.75. Special sale price, \$38.95 less cartridge. Large 45 RPM spindle, \$2.50 extra. 3/532 Collaro changer with G.E. Golden Treasure RPK-052 cartridge, \$66.95.

GC-80 Garrard "Triumph" 3 speed automatic changer, 13 1/2" x 10 1/2" x 10 1/2" deep and 8" high. 31 1/2" below motor board. Net price, less cartridge, \$48.51. 45 RPM spindle \$3.43 extra. GC-80 with G.E. RPK-052 Golden Treasure cartridge, Net \$50.51. GC-80 with crystal slip-over cartridge, only \$52.48.

GC-80 Garrard "Crown" 3 speed automatic changer, 13 1/2" x 10 1/2" x 10 1/2" deep and 8" high. 31 1/2" below motor board. Net price, less cartridge, \$50.11. With crystal slip-over cartridge, \$52.96. With G.E. RPK-052 Golden Treasure, \$54.11. 45 RPM spindle, \$3.43 extra.



OUR NEW ADDRESS IS

1903 MCGEE ST., KANSAS CITY, MISSOURI

RADIO & TELEVISION NEWS

REGULAR \$59.95 LIST TIMEX MAGNETIC RECORDER McGEE'S SPECIAL \$29.95 PURCHASE SALE RECORDS AND PLAYS BACK—PLAYS 16 2/3 AND 45 RPM RECORDS

MODEL 40 TIMEX RECORDER \$29.95 CRYSTAL PICKUP HEAD TO PLAY PHONO RECORDS \$2.95 EXTRA

A product of United States Time Corp. (Timex) A multiple purpose machine made to retail for \$59.95. Records a 16 2/3 and 45 RPM carload and you save by buying now at only \$29.95, plus \$2.95 for a 45 RPM record adapter and crystal head for 16 2/3 or 45 RPM phono records. Records and plays back for 1 1/2 minutes on a wafers thin flexible magnetic disc. Make recordings of your family—use for office dictation—dictate records that may be mailed without breaking. Attractive brown plastic case, 9 1/2" x 11 1/2" x 4 1/2". Turntable speeds 16 2/3 and 45 RPM. Response 100 to 4000 cps. Amplifier has been level indicator, volume control and selector knob with playback, record and phono positions. Uses 12AX7, 60C5, 6C4 and 30W4 tubes. Built-in 4" speaker. Complete with Shure variable reluctance microphone. Provides faithful reproduction at low volume of voice or music, recorded through the microphone supplied or direct from your radio or TV. As simple to operate as a record player. Stock No. T108-81 recorder, ship. wt. 12 lbs. Sale price, \$29.95.

Recording disc, package of 6 for 99¢. One blank shipped with recorder. You may purchase a plug-in crystal pickup to adapt this recorder for playing 16 2/3 or 45 RPM phono records for only \$2.95 extra.



SALE PRICE **29.95**
MODEL 40 TIMEX

8" EXTENSION SPEAKER \$16.95 EXTRA

For \$16.95 extra you can have our regular \$19.95 Imperial 16" extension speaker, equipped with an 8" 8-Ω speaker as described on the opposite page. When you order this with your Timex recorder we will install a jack which makes your Timex play 45 RPM records with better tone quality and with the control in the record position unit doubles as a small public address system.

MINIATURE BROADCASTING STATION FOR THE HOME NEW 1955 MODEL WITH CRYSTAL MIKE \$9.95

Sensational new model BCL-63 miniature broadcasting station for microphone and phonograph. Can be received on any broadcast radio in the home. Has wires to connect, tunes in just like a radio station. Has input jacks for crystal mike or record player. Complete with 12NB and 70L7 tubes and instructions. Operates on 110 volts AC, simple to operate; one control fades from microphone to record. Frequency can be adjusted so as not to interfere with local radio stations. Miniature broadcasting station, complete with crystal hand mike and instructions. Ship. wt. 4 lbs. Set price \$9.95.

6" SESSIONS CLOCK-TIMER With Plastic Cabinet \$3.95

6" Sessions Clock-Timer in plastic case 7" x 9 1/2" tall, 3" deep. Was intended for a kitchen clock radio. Lower portion has a usable space of 6 1/2" x 4" high and 3 1/2" deep with 3" diameter hole in front. Many ways this attractive clock and cabinet could be used, such as mounting a small bell below the clock for use as a kitchen clock and timer. The clock has a wooden cabinet and 15 amp. 125 volt switch to turn on appliances at any pre-set time. Case available in Ivory, Green or Yellow. Stock No. MCT-63, Sessions Clock-Timer with shade of your color choice. Sale price only \$3.95.

\$29.95 17" FULL DOOR \$29.95 Fig. (e) No. AM-430, Mahogany with full doors. 30 1/2" h., 21 1/2" w., 17 1/2" d., 18 1/2" deep. Blank panel. TV chassis area 20 1/2" x 17" TV only. Radio cut for 10" speaker. Ship. wt. 90 lbs. On sale at less than it cost a famous TV factory. Sale price, \$29.95.	\$19.95 DELUXE 21" MAHOGANY TV-PHONO CABINET No. NRT-21M, Deluxe piano finish mahogany combination radio-phon-TV cabinet for 20" or 21" TV chassis. Beautiful front door style with matching front panels. 37" high, 40 1/2" wide and 23 1/2" deep. Radio cut for a 12" speaker. TV chassis area 21" high, 23 1/2" wide and 10" deep. Changer shelf 15" x 17" with 3" height clearance. Ship. wt. 90 lbs. No. NRT-21M, mahogany cabinet, sale price, \$19.95. 21" mahogany and safety glass. \$9.95 extra. No. A13-9, ball bearing changer drawer slides, \$1.29 pr., extra.	\$19.95 17" with PHONO DRAWER \$19.95 Fig. (g) No. 21, 17" mahogany TV cabinet with phono drawer 40" h., 24" w., 18 1/2" deep. Blank panel. TV chassis area 19" h., 20 1/2" w. Changer drawer 18 1/2" x 17" deep. Radio cut for 10" speaker. Ship. wt. 75 lbs. Sale price, \$19.95.	\$22.95 BT-210 \$22.95 No. BT-210, Blonder case 21" TV cabinet. 37 1/2" high, 34" wide and 20 1/2" deep. TV chassis area 20 1/2" x 17" TV only. Radio cut for 10" speaker. Ship. wt. 90 lbs. No. BT-210, mahogany cabinet, sale price, \$22.95. No. BT-210, mahogany 21" TV cabinet, same as above, sale price, \$19.95.
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RMS VHF TV BOOSTER \$495

Latest RMS TV booster for all VHF channels. Continuously variable for channels 2 thru 13. Variable gain control prevents overloading on powerful stations. Brown plastic case 4 1/2" x 8 1/2" x 5". Operates on 110 volt. One 120 volt. One 120 volt. One 120 volt. Model SP-8, RMS TV booster, special sale price only \$4.95.

6-TUBE, 2-BAND RADIO KIT \$14.95

6-18 MC 550-1650 KC
A tube, 2 band AC-DC radio kit, complete with speaker and plastic cabinet. Popular with schools and colleges for training in radio. Receives broadcast and 6-18 mc shortwave. Full 3 gang superheterodyne with 6" speaker and slide rule dial. A complete kit with tubes: 12X6, 2-12XK7, 12XQ7, 60L6 and 302B. Dimensions: 10 1/2" x 10 1/2" x 4 1/2". Ship. wt. 12 lbs. Model M60-2, Set \$14.95.

3-SPEED AMPLIFIED PLAYER KIT \$10.95

2 TUBE AMPLIFIER—8" SPEAKER

New, 3 speed amplified record player kit for only \$10.95. Leatherette covered cabinet 8 1/2" x 12" x 18 1/2" high, made to set on floor. Complete with 3 tube amplifier has separate tone and volume controls, 12B6, 6X4 and 60B5 tubes. Heavy 8" speaker, all play pickup, motor and turntable. Cabinet in great. All you have to do is follow the necessary items to build this 3 speed amplified record player. Buy this kit at less than the cost of the parts. Shipping weight 13 lbs. Model No. SP-743K, Sale price only \$10.95.

50-WATT BOOSTER AMPLIFIER \$39.95

BOOSTER AMP.

2-Mike Pre-Amp \$12.95 Extra. Not a Kit, but a Manufactured Amp.
A sensational value. A 50 watt booster amplifier with push-pull, parallel 6L6 output to allow the use of 2 microphones and one low level input. The amplifier has one input jack with 1 volt input giving 50 watts of audio. Amplifier has a 6 L 6, matched case high fidelity output transformer with taps at 4-8-10-60 and 250 ohms. 330 mil power transformer and 5046 rectifier. Includes tubes: 4-6L6, 7N7 and 5046. Two variable tone controls for master volume and bass boost tone control. Chassis size, 8" x 6 1/2" x 1 1/2". Model No. PA-55N, Ship. wt. 26 lbs. Sale price, \$39.95. PA-55N, 2 mike input pre-amplifier plug in directly to the PABN 50 watt booster amplifier. Allows use of 2 microphones, either crystal or dynamic and one low level input. Furnished with a 6 L 6, 5046 and plug for remote control of the 50 watt booster. Chassis size, 8 1/2" x 3 1/2" x 3 1/2". Model PA-55N, Sale price, \$12.95.

10" PM SPEAKER AND LEATHERETTE BAFFLE

Now, buy a full 10" PM speaker with Alnico V magnet with our top quality 10" leatherette wall baffle, both for only \$14.49. Baffle is finest joint construction with rounded corners, quality covering and plastic grid cloth. Stock No. 10BN, 10" speaker and baffle, \$9.49 each, 2 for \$14.49.
12" PM speaker with same quality 12" wall baffle, only \$7.49 each, 2 for \$14.00.

McGEE RIDO COMPANY
F.O.B. KANSAS CITY
SEND 25¢ OR FULL
REMITTANCE WITH ORDER.
CAL. SENT C.O.D.

UHF CONVERTER TUNERS \$2.95

3 FOR \$7.50

Take your choice of any of these three UHF converter-tuners at \$2.95 each, 3 for \$7.50. (1) Galaxy in-duct-tuner with 6AP4 and 12W2 diodes. This is a complete UHF osc-tuner similar to the one used by Mallory in a converter and by many set manufacturers in their UHF TV sets. (2) CBS-Columbia single channel UHF converter intended for use in UHF1 and UHF2 CBS TV sets. Complete with 6AP4 tube. (3) Small compact UHF converter tuning assembly with 6AP4 tube and diodes. Many applications for this in UHF. Your choice of any of these for only \$2.95 each, 3 for \$7.50.

FAMOUS STANDARD COIL CASCODE TUNERS

TV-2000 series Standard Coil cascode tuners complete with 6AG5 and 6AR7 or 6AR5 tubes. Thousands of TV sets use this famous tuner. Tunes 12 channels (2 thru 13). For 21 mc I.F. circuit. This tuner will give 2 to 1 better reception than the old pentode type. Many television sets replace the old pentode with this cascode model. Available with either 3 1/2" or 4 1/2" shaft length. A tremendous purchase makes our low \$12.95 price possible. Specify shaft length desired. Stock No. TV-2000-3. Sale price \$12.95 each, 2 for \$25.00.

No. TV-4001-7, 41 mc Standard Coil cascode 12 channel tuner with 13th position for use with separate UHF tuner. 6AG5 shaft. With tubes 6AR7 and 6AR5. Used in Sentinel, MW, Arvin, etc. Sale price, \$12.95.

STANDARD COIL PENTODE TV TUNERS \$9.95

SC-947 Standard Coil Pentode 12 channel tuner, as used by Emerson 680B, 689, etc. Fine tuning shaft insulated from ground. Filaments shunted with resistor for 4 amp drain. 3 1/2" shaft. With tubes 6AR5 and 6AR7. Sale price, \$9.95.

SC-948 Standard Coil Pentode 12 channel tuner with 6AR5 or 6AR7 and 6AR5 tubes. Millions of TV sets now in use have this tuner. 1 1/2", 2 1/2", 3", 4" or 5" shaft length. You can replace that old tuner cheaper than it cost to replace. Sale price, \$9.95.

TWO-TUBE SARKES-TARZIAN TV TUNER \$8.95 WITH TUBES

New 2 tube Sarkes-Tarzian No. TT-3A, 12 channel TV tuner. 21-35 mc. Popular in many makes. Also, ideal for general replacement use. Has 6AR5 and 60B5 tubes. Used in CBS, Arvin, Crosley PFTOLBU, TOLR, TOLU, F31CULOH, etc. Also, ideal for general replacement use. A good replacement for one tube tuners. 3 1/2" shaft. No. TT-3A, Sale price, \$8.95. Tubes 6AR5 and 60B5 not included at left.

3 TUBE SARKES-TARZIAN, RCA, GEN'L. INST.

TV-3735, 3 tube Sarkes-Tarzian, 12 channel tuner, with 2-6AG5 and 6C4 tubes. 3" shaft. Used in Air King 700 series. Sale price, \$9.95.

Type 3, 3 tube Sarkes-Tarzian 12 channel tuner with 6C4, 6B6B and 6AG5 tubes. Use with separate sound or intercarrier. Mac converter coil. 3 1/2" shaft. Sale price, \$7.95.

RCR 4P-12, 12 channel printed circuit tuner used in Nationalcrafters. With 6AG5 and 6C4 tubes. 6 1/2" shaft. Sale price, \$9.95.

61-44 General Inst. 12 channel tuner with 6AG5, 6AG5 and 6AR5 tubes. 3" shaft. 21 mc I.F. Sale price only \$4.90.

TUNERS FOR EXPERIMENTERS, BUILDERS \$2.95

Bargain priced tuners, less tubes for the builders and experimenters. Ideal for building a solid strength meter, etc. Type 4 Sarkes-Tarzian, has screw driver slot for tuning instead of concentric shaft, \$2.95 less tubes.

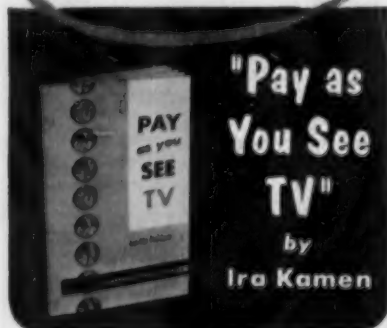
61A-13N, 3 tube 61A 20M11, removed from sets may need rods, \$2.95 less tubes.

61-13N, 3 tube 61A 20M11, removed from sets may need rods, \$2.95 less tubes.

OUR NEW ADDRESS IS
1903 MCGEE ST., KANSAS CITY, MISSOURI

everyone's talking about
"subscription TV"

here's the
Sams book
WITH THE FACTS!



Now you can be authoritatively informed on the case for "Subscription Television"—the important subject you've been hearing so much about. This book gives you the "inside" facts in four informative chapters presenting the case for this significant new TV development:

SECTION 1: Why Subscription TV

Discusses the role to be played by Subscription TV in the fields of education and sports; Subscription TV and first-run movies; Subscription TV as a benefactor of the arts, etc.

SECTION 2: Subscription TV Systems

Describes three important Subscription TV Systems which have been proposed: Phonevision, Subscriber-Vision and Telemeter. Explains how each system will work.

SECTION 3: Closed Circuit TV

Covers the role of community antenna systems in "Pay As You See TV"; closed circuit TV in Hotels; box office TV; Subscription TV for multiple dwellings, etc.

SECTION 4: Effects of Subscription TV on the Servicing and Manufacturing

Discusses the significance of Subscription TV for the TV Technician and the TV manufacturing industry.

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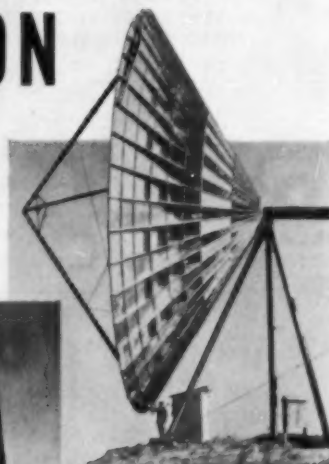
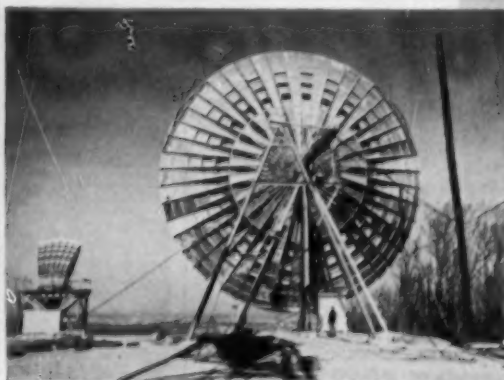
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(outside U.S.A. priced slightly higher)

"OVER-THE-HORIZON" TRANSMISSION

Direct TV transmission through space at distances up to 200 mi. is now possible without relays.



Side and rear views of the new 60-foot experimental antenna being used by Bell Labs in making its "over-the-horizon" transmission tests. The small scoop-shaped object at left in photo at left is one of the conventional antennas for line-of-sight systems.

THE direct transmission of television signals for distances up to 200 miles, without relay stations and at ultra-high frequencies, has been accomplished by the Bell Telephone Laboratories and the Massachusetts Institute of Technology.

The new technique is an extension of the transmission methods recently applied to the continental defense system.

The principal virtue of the new "over-the-horizon" transmission is that longer communications bridges are possible over water and rugged terrain. In the present microwave relay network across the United States, relay stations are 30 miles apart.

For many years, line-of-sight transmission between antennas placed on towers on the horizon was thought to be the only practical means of transmitting by radio the wide bands needed for television and multi-channel telephone service.

This has now been disproved after years of research at M.I.T. and Bell Labs. The Bell research stemmed from the Laboratories' success with transcontinental microwave systems for carrying telephone conversations, radio and television programs from coast-to-coast and their continued interest in radio propagation. The M.I.T. interest was stimulated by work for the Government in radar and overseas broadcasting.

Scientists knew that ultra-high frequencies traveled over-the-horizon under certain conditions but believed them to be too weak and undepend-

able for practical day-in-and-day-out applications.

In the course of investigating occasional interference attributed to these waves, however, the scientists discovered that many actually overshot the relay towers they were aimed at and arrived at farther points with remarkable consistency.

The next step was to provide reliable long distance transmission over-the-horizon. M.I.T. and Bell engineers did this by erecting larger antennas and using higher power than is employed in conventional microwave systems. Thus, they put to use the weaker signals that drop off from a straight radio beam beyond the horizon and are reflected or scattered to distant points by the atmosphere.

In order to make use of over-the-horizon transmission, 10 kw. transmitters and 60-foot diameter antennas are being used. This is 20,000 times the power and 30 times the antenna area used in the present transcontinental system. It was found necessary to employ the lower frequencies in the u.h.f. band to develop, with available equipment, sufficient power to attain a satisfactory degree of reliability.

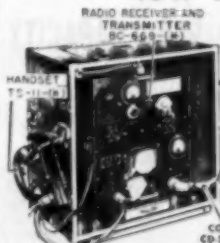
The scientists emphasize that this success with over-the-horizon transmission will probably result in a supplement to, rather than a replacement of the line-of-sight radio relay systems presently in use.

The new technique, unlike ionospheric scatter, provides signals that are useful for the wide bandwidths required for TV transmission.

-30-

REAL BARGAINS IN BEST ELECTRONIC SURPLUS

45W 6-CHANNEL RADIO TELEPHONE



TELEPHONE RECEIVER AND TRANSMITTER (BC-669-A) with 12 crystals (6 for X-mit, 6 for receive) for operating on 1740, 2082, 2280, 2340, 3422.5 and 4255 KC. Receiving crystals differ by 355 KC (IF frequency). Most of these crystals can be reground to marine band frequencies. Receiver uses high-efficiency 10 Tube Superhet circuit with RF Stage for maximum selectivity, built-in loudspeaker. Static Filter (Noise Eliminator) Circuit with Switch, and RF Gain Control. Transmitter uses 8 Tubes (2-807's in Final) with 100% Plate Modulation, and Metering Switch with multi-range millimeter scale for instant checking of any part of transmitting circuit.

45-WATT RADIOTELEPHONE (BC-669-A, B, or C Models), complete with all tubes, crystals (as specified), Inst. Book, Connecting Cord CD-515 (to Power Supply). Modification and Power Supply Constructional Data. **USED, GOOD CONDITION.** Shpg. wt. 195 lbs. **EACH \$99.50**

SAME AS ABOVE, NEW UNUSED CONDITION each \$139.50

MODELS BC-669 D or E. Same as Above, but pro-



20-80 MC TRANSCEIVER

This famous Navy (Model TBV) Walky-Talky is an excellent buy for amateurs, experimenters, or for emergency short-range communications where FCC regulations permit. Can be easily converted to 2 meter or higher frequency operation. Both transmitter and receiver cover 20 to 80 MC in 4 bands, to provide voice and CW communications. A 5 MC crystal calibrator circuit is incorporated to check and maintain frequency. Receiver has a built-in speaker for instant checking of other transmitters and receivers. Transmitter is modulated in the push-pull type, using 6-80 tubes (plus 1-187 modulator tube, driven by Type 30 amplifier, and receiver is super-regenerative, using another 6-80A audio detector, with a 950 screen as an RF amplifier to provide additional sensitivity, selectivity and minimized radiation when receiving. Operation is either from a battery pack which supplies 150 volts (30" voltage, 3.0 volts (with tap at 1.5 V) and 7.5 vdc, and 7.5 vdc bias voltage) or from a vibrator pack which will supply all of the above voltage when used from a miniature 4 V. Storage Battery. All units are clean, excellent condition.

TV-PORTABLE TRANSCEIVER, only! Includes Tubes, Carrying Case and Schematic Diagram. Shpg. wt. 55 lbs. **EACH \$99.50**

4 V. VIBRATOR PACK, for above, Shpg. wt. 7 lbs. **EACH \$9.95**

MICROPHONE & HEADSET, with appropriate Plug Connectors, Shpg. wt. 1 lb. **PER SET \$3.75**

INSTRUCTION MANUAL, Complete original, technical manual, sold only if Transceiver is ordered. **\$3.75**

COMPLETE TBV WALKY-TALKY, All above in checked-in antenna sections, beam loudspeaker, etc. in checked-in carrying case, ready for operation except 4 V. Storage Battery. Shpg. wt. 45 lbs. **PER COMPLETE SET \$49.50**

SELECTIVE RINGER FOR MOBILE or SHIP-TO-SHORE RADIOTELEPHONES



Permits Phone Operator to call your Radiotelephone exclusively, when operator has a call for you, by ringing a bell or lighting a light. Designed & Mfg. by Western Electric, MODEL 107A, modern, compact and efficient. Can be attached to any receiver, complete instruction book supplied. Dim.: 15 1/2" long, 5 1/2" high, 6 1/2" wide. Shpg. wt. 25 lbs. **NEW UNITS.** Reg. value \$245.00 each.

OUR LOW PRICE—EACH \$85.00

INFRA-RED IMAGE "SNOOPERSCOPE" TUBE EXTRA-SPECIAL !!

We've sold thousands of them to Latin, experimental, industrial, studio, etc. By using Infra-Red rays, this tube enables you to see in the dark. No sensitivity, no amplifiers, just a high-voltage power supply in all you need with this tube. Image in greenish-white on 10" screen. For night photography, signalling, sniffer or sniper scopes, underwater detectors, etc. British made. 6000 HRS OF 6 ONLY! Literature and diagrams furnished with each sale. Shpg. wt. 2 lbs.

Slashed to 3 for \$10.00

FRONT-END LENS, for Infra-Red Tube. Launch & Lomb. **\$10.00**

Plain, Mounted Type. **\$1.90**

THE BIGGEST BARGAIN IN PLEASURE OR FISHING BOAT RADIOTELEPHONE! LAST CHANCE to get a sensational value in a big-power ship-to-shore Radiotelephone. This Transmitter-Receiver (BC-669-A) is beautifully and ruggedly built. Designed for rough military service and engineered for maximum efficiency, it will provide trouble-free long-range communications from mobile or fixed station installations. Both Transmitter and Receiver operate in the frequency range of 1680 to 4450 KC, and both are crystal-controlled on all six channels in this range. Manual tuning of the receiver is also provided. Power Output (Phone) is rated nominally at 45 watts.

Transmitter operation is performed with a minimum of controls, after installation adjustments have been made, consisting of: ON-OFF Power Switch, CHANNEL SELECTOR Switch to proper position, and ANTENNA TUNING Control rotated for maximum indication in RF Meter. Furnished are instructions and drawing for circuit modification in anticipation of new FCC regulations concerning harmonic suppression of transmitters operating in the 2 and 3 MC marine band. Operation of the 45-Watt Radiotelephone may be from 110 V. AC, 110 V. DC, 32 V. DC, 24 V. DC, or 12 V. DC. Complete constructional data and diagrams are furnished for building any of the above power supplies at minimum cost. For those who prefer to purchase ready-made power supplies, we have set up quotations for any of the above voltage inputs. Each set is supplied with instructions and drawing for circuit modification in anticipation of new FCC regulations concerning harmonic suppression of transmitters operating in the 2 and 3 MC marine band. Operation of the 45-Watt Radiotelephone may be from 110 V. AC, 110 V. DC, 32 V. DC, 24 V. DC, or 12 V. DC. Complete constructional data and diagrams are furnished for building any of the above power supplies at minimum cost.

VIDEO ALSO CW (telegraphy), transmission and reception (incorp. BFO). **NEW, EACH \$169.50**

75-11 HANDSET, with appropriate plug connector, **EACH \$14.50**

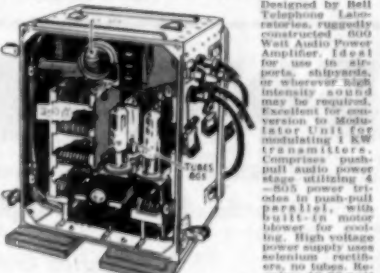
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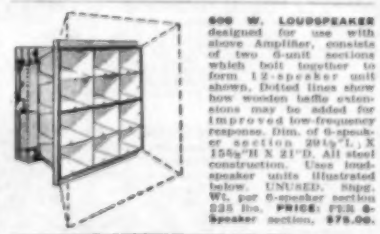
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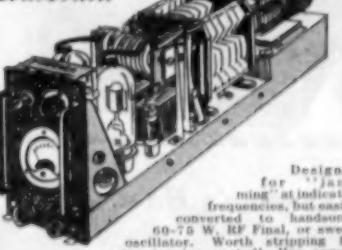
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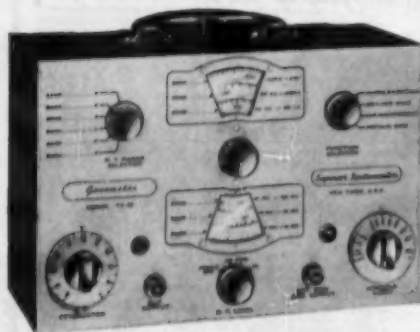
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SHORT-CIRCUIT PROTECTION FOR METERS

By P. KOUSTAS

Tube Div., Radio Corporation of America

Three circuits which can be used to prevent damage to meters from short-circuit voltages as high as 5000 volts.

WHEN microammeters and low-range milliammeters are used in a supply delivering several hundred volts, they may be damaged beyond repair by sudden short circuits. In such applications, fuses and relays are not adequate protective devices. This article will describe three circuits which can be used to prevent damage to current meters of any range from short circuit voltages as high as 5000 volts.

Current meters are usually protected against overload by fuses or relays. These devices provide adequate protection in applications where the overload occurs rather slowly and is limited to about 200 per-cent of the normal load. However, when a microammeter or milliammeter is used in a supply delivering 1000 volts, an instantaneous short circuit may produce a peak current several hundred to several thousand times the normal meter rating, depending on the meter impedance, the regulation of the supply, and the size of the output filter capacitors. In such cases, the meter movement is usually destroyed before a fuse or relay can interrupt the circuit. An additional disadvantage of fuses is that they do not allow immediate resumption of current. Because relays which operate at low currents must have rather high resistance, they introduce other disadvantages when voltage regulation is of the utmost importance. In the case of low-range microammeters, no fuse or relay can perform satisfactorily.

The circuits to be described were developed originally to protect low-range microampere and milliammeter meters in an unusual laboratory application. The first circuit, a comparatively simple device, is used when the meter range permits the use of a relay and the voltage drop across the relay is not objectionable. The second circuit, which is more complex, may be used for any current range and has negligible effect upon the supply with which it is used. The third circuit is a more complex version of the first, developed to accommodate voltages as high as 5 kilovolts.

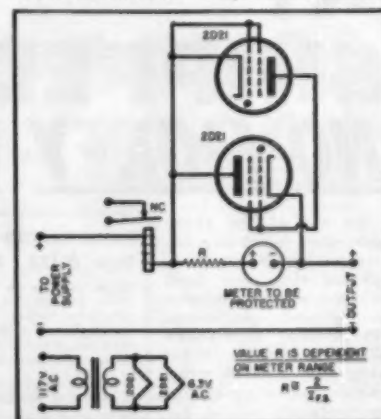
Relay Circuit

When a short circuit occurs in the load fed from a well regulated supply, the full voltage of the supply is applied across the current meter for a few milliseconds. The time required for a relay to close, thus either short-circuit-

ing the meter or shutting off the supply, usually is not short enough to prevent damage to the meter. The meter can be protected during this "delay" time, however, by the use of two thyratrons, as shown in Fig. 1. When a thyatron is placed across the meter, the surge voltage produced by the short circuit causes it to fire, and the relatively high impedance of the meter is shunted by the low impedance of the ionized thyatron for the time required for the relay to act. The use of two thyratrons of opposite polarity in parallel protects the meter against both positive and negative surges.

The RCA-2D21 thyatron ionizes in approximately 0.5 microsecond and requires an ionization voltage of about 35 volts. The surge voltage across the meter, therefore, is limited to 35 volts and the energy the meter movement must absorb is greatly decreased. When the meter is directly shunted with the thyratrons, it still absorbs enough energy to slam the pointer against the pin. However, the insertion of a small resistance, R , in series with the meter terminals limits the amount of energy that must be dissipated by the meter movement. The amount of resistance required is related inversely to the current range of the meter. The minimum value of R in ohms is equal to 2 divided by the meter scale in amperes; therefore, the resistance should be selected so that the full-scale meter rating times the resistance equals two volts or more. When the circuit shown

Fig. 1. A simple meter protective circuit. It is used for meter ranges above 5 ma.





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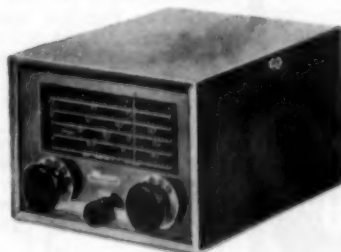
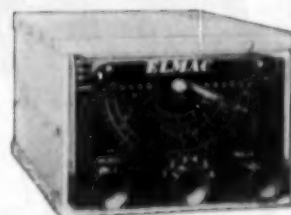
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in Fig. 1 is used with a *Potter & Brumfield* Type LM11 relay having a 5000-ohm coil, a 10 milliamper meter can be placed across an 800 volt power supply with no danger of damage to the meter from short circuits. When higher-current meters are used, the relay should be shunted with an appropriate resistance to protect against normal overloads.

Multi-Range Meters

Because almost all relays which operate at a current of a few milliamperes have a coil resistance of several thousand ohms, they produce a voltage drop which may be objectionable in applications where voltage regulation is of the utmost importance. Furthermore, relays may not operate with sufficient positive action at currents lower than 5 milliamperes.

The second protective circuit, shown in Fig. 2, operates by sampling the voltage drop across the meter terminals. This type of circuit is particularly useful for multi-range meters, in which the voltage across the meter terminals is independent of the current range used. This circuit can be used to protect meters of any current range, and introduces no appreciable loss in supply regulation.

In the circuit of Fig. 2, a d.c. amplifier tube amplifies the voltage across the meter terminals sufficiently to fire a thyatron. The thyatron then actuates a relay which turns off the supply primary and opens the plate circuit of the thyatron to stop conduction. Because the time cycle of this device is limited by the relay, the two thyatrons described previously are still required to protect the meter against instantaneous short circuits. The RCA-5691 shown in Fig. 2 is used in a balanced circuit to prevent line-voltage changes from affecting the triggering point. The 5691 is a long-life, ruggedized version of the 6SL7GT. After the balance

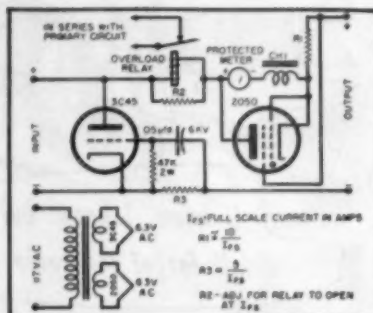


Fig. 3. High-voltage version of Fig. 1 unit.

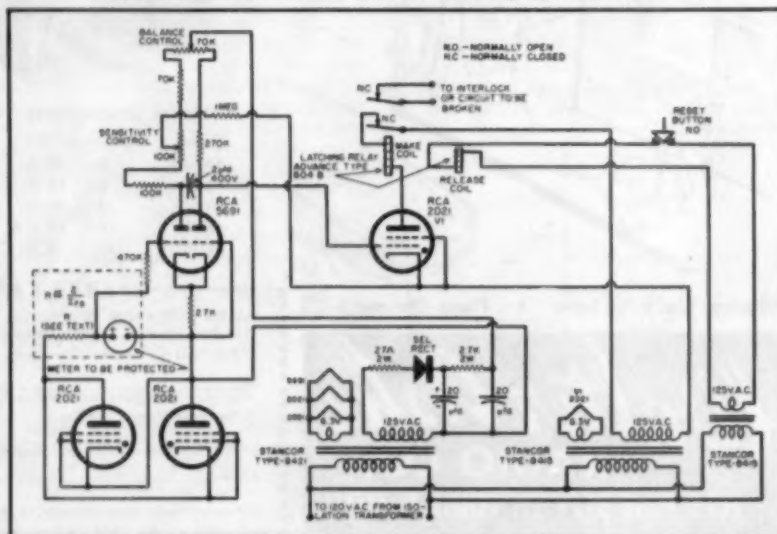
ing potentiometer is adjusted to provide equal voltages on both plates of the 5691, the sensitivity control is adjusted so that the 2D21 will fire at a current slightly higher than full scale of the current meter. The capacitor between the two plates of the amplifier tube prevents operation due to stray transient pickup.

When two or more units are used simultaneously, or when different units are at widely different potentials, a separate transformer is used to operate the release coil of the relay so that all units can be reset by a single-pole switch. The overload units must float at the same potential as the meter to be protected. The chassis of the protection unit should be insulated for this voltage, therefore, and an isolation transformer should be provided when the voltage between the meter and ground is larger than 500 volts. The circuit of Fig. 2 can be used to protect a 100 microampere meter placed across a 1600 volt supply.

High-Voltage Circuit

When the circuit of Fig. 1 was used to protect a milliammeter placed across a 5000 volt supply, the overload relay literally blew apart when the supply was short-circuited. Although the relay

Fig. 2. A "universal" meter protective circuit. It may be used for multi-range microammeters or milliamper meters of any type. See discussion.



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1A3	.49	1X2A	.96	6C6	.49	6U7G	.39	14A5	.49	70L7GT	.99
1A4/1A4P	.84	1X2B	.96	6CB6	.76	6W4GT	.49	14A7/12B7	.49	71A	.39
1A5GT	.39	2B7	.79	6D6	.49	6X4	.39	14J7	.99	75	.44
1A6	.69	3Q4	.59	6D8G	.89	6X5GT	.39	14N7	.59	78	.44
1A7GT	.44	3V4	.79	6F5GT	.39	7A4/XXL	.49	14X7	.99	83V	.74
1B3GT	.98	5U4G	.64	6F6GT	.59	7C4	.49	20	.29	84/6Z4	.49
1B5/255	.64	5Y3GT	.47	6G6G	.59	7E5	.49	24A	.29		
1C5GT	.39	5Z3	.59	6H6	.44	12A6	.39	25A6G	.49	SPECIAL PURPOSE TUBES	
1C6	.47	6AB4	.66	6J5GT	.45	12ABGT	.89	25L6GT	.71		
1C7G	.47	6A7G	.59	6J6	.87	12AT6	.57	25Y5	.79	5R4GY	1.29
1C8	.54	6A8G	.79	6K5GT	.59	12AU7	.83	25Z5	.51	6AN4	1.29
1D5GP	.79	6A8GT	.79	6K6GT	.63	12AW6	.69	25Z6GT	.49	6A57G	3.30
1D7G	.47									6BL5GT	6.25
1D8GT	.75									6J5WGT	1.77
1E5GP	.84									6L6GAY	1.19
1E7G	.39									6SA7WGT	6.99
1F5G	.89									6SK7GT	.56
										6SL7WGT	1.67
										12SA7GT	.56
										19	.67
										19C8	.69
										19V8	.59
										6113	.89
										NU300	19.50
										807	1.55
1F6	.99	6AB7/1853	.69	6K7G	.39	12B7/14A7	.49	27	.19	CATHODE RAY NATIONAL UNION 17"	
1G4FT	.59	6AG5	.59	6L6GA	.89	12BA6	.68	34	.19		
1G6GT	.59	6AG7	.79	6L7	.59	12BD6	.49	35/51	.29	17AVP4	9.89
1H6G	.67	6AH4GT	.92	6N7GT	.59	12BE6	.71	35A5	.59	N. U. VIDEOTRON PICTURE TUBE CHECKER	
1J6GT	.47	6AJ4	.99	6P5GT	.69	12F5GT	.39	35B5	.49		
1L4	.49	6AL5	.59	6Q7GT	.49	12J5GT	.45	35C5	.39	FACTORY PACKED List \$29.95	
1LA4	.69	6AQ5	.69	6S4A	.67	12K7G	.49	35L6GT	.71		
1LA6	.79	6AQ6	.49	6S7	.49	12Q7GT	.59	35W4	.46	MILO \$16.88 SPECIAL	
1LC5	.69	6AU6	.64	6SA7GT	.49	12S8GT	.59	35Z3	.49		
1LC6	.59	6AX4GT	.89	6SB7Y	.99	12SA7	.79	35Z5GT	.49		
1LE3	.59	6B4G	.79	6SF5GT	.49	12SC7	.67	41	.29	MILO \$16.88 SPECIAL	
1LG5	.69	6BA6	.69	6SF7	.49	12SF5GT	.39	43	.49		
1LNS	.79	6BA7	.59	6SG7GT	.49	12SG7GT	.69	47	.39	MILO \$16.88 SPECIAL	
1P5GT	.69	6BC7	.79	6SH7	.49	12SH7	.69	50B5	.72		
1Q5GT	.89	6BD5GT	.89	6SJ7	.49	12SK7GT	.49	50C5	.71	MILO \$16.88 SPECIAL	
1R5	.89	6BE6	.69	6SK7GT	.49	12SN7GT	.81	50C6G	.68		

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device protected the meter, it was necessary to find some other means of quickly absorbing the energy stored in the supply filter.

The circuit shown in Fig. 3 is a high-voltage version of the relay-operated circuit of Fig. 1. In the high-voltage circuit, the hydrogen thyatron requires no bias supply for cut off, and it can dissipate large amounts of energy for very short periods. The positive pulse required to fire the 3C45 is developed across the resistor R_2 when a short circuit occurs. The value of R_2 , which is dependent upon the normal operating current of the supply, is not critical and should be approximately equal to 5 divided by the full-scale current $I_{F.S.}$, in amperes.

The amount of series resistance required to prevent excessive "pointer slamming" at high voltages becomes too large for acceptable regulation. However, a conventional filter choke may be used in place of the resistor to present a high impedance to the short-circuit transient. The inductance of the choke is not critical. The current rating should, obviously, be the same as that of the supply. The 2050 thyatron shown in Fig. 3 performs the same function as the 2D21's in the first circuit described. However, a small amount of cathode bias is necessary in this circuit to prevent the normal IR drop through the choke from firing the thyatrons prematurely. It should be noted that separate heater transformers are required for the 3C45 and the 2050 because they are in opposite sides of the supply.

When the protective circuit shown in Fig. 3 is used, a direct short circuit can be thrown across a 5000 volt, 0.5 ampere supply with no resultant damage to a 1 milliamperemeter.

The author wishes to express his thanks to Mr. L. J. Giacometto of the RCA Laboratories in Princeton, N. J., and to Mr. John Malone of the Tube Division for their assistance. —30—

TECHNICIAN CLASS CHANGES

AS A result of its consideration of petitions for rule making filed by James M. Price and Tom A. Walker, the Commission adopted the Notice of Proposed Rule Making in this proceeding. The Notice proposed amendment of Section 12.23(d) to permit operation by Technician Class amateur operators in all amateur frequency bands above 50 mc. which would have the effect of adding 50-54 mc. and the 144-148 mc. bands to the privileges presently available to the Technician Class license holders.

Because of opposition expressed by the ARRL to opening the 144 mc. band to this class of licensee, the FCC dismissed that portion of the petition but granted the other request as follows:

"Section 12.23(d) of Part 12, Rules Governing Amateur Radio Service, is amended as follows: (d) Technician Class. All authorized amateur privileges in the amateur frequency band 40 to 54 mc. and in the amateur frequency bands above 220 mc." Effective as of 3 a.m. EST, April 12, 1955. —30—

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NORTH ADAMS, MASS.

June, 1955

Tone Transmitter (Continued from page 63)

of the chassis. Wire in the vibrator supply. The vibrator output should be about 295 volts, but is OK if it is over 250 volts.

Connect the metering circuit for the oscillator and power supply. Test the oscillator by tuning the plate capacitor, C_4 , for a dip on the meter. (Use a non-metallic tuning stick.) It is very easy to tune to the second instead of the third harmonic in initial adjustment. Check the frequency with a wavemeter or a 27-mc. receiver. It may be necessary to spread or compress the turns of the plate coil, L_6 , to obtain the proper oscillator range. If so, adjust the spacing of the coil until the meter dip occurs at about one-half the capacitor tuning range. No adjustment of the cathode tuning capacitor is necessary except to set it at full mesh. It could be replaced with a fixed value capacitor.

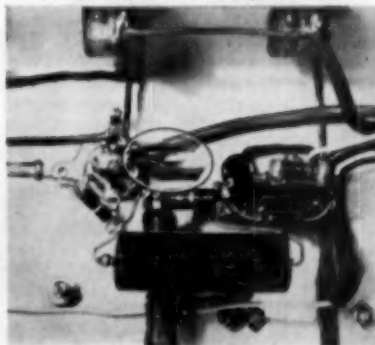
When the oscillator is operating correctly, wire the final amplifier, being certain to use the plate pin shield mentioned previously. Run a jumper wire to "B+" for testing as shown dotted in Fig. 2. Set the meter switch to the "Amp." position, and tune C_5 for a dip.

The audio section chassis, containing V_4 , V_5 , and V_6 , is made from a strip of aluminum, two inches by seven inches, with a flange on the side for mounting to the main chassis. Note the terminal strip provided on this subchassis for connecting the push-button leads (Fig. 4). The method of mounting the audio section provides shielding for these circuits.

After bolting the subchassis to the main chassis, connect the heaters of the audio section to the heater pin of V_2 on the socket. Remove the "B+" jumper and hook up the "B+" as shown in Fig. 2.

To test the completed unit, connect headphones to the voice coil of the oscillator transformer, T_1 . Tones should be heard when push-buttons are depressed. To insure smooth ones, adjust each push-button so that its capacitor is grounded just before the resistor circuit is closed.

Fig. 5. Bottom view of the final amplifier (V_5) socket showing the small strip of brass used to shield pin 5, the plate pin, from the grid circuit.



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"OPERATION STARLING"

By MILTON H. CROTHERS

Asst. Prof., Electrical Engineering Dept., University of Illinois

Science devises a means of "giving the bird" to the flocks of pesky starlings that make urban living more difficult.

ONE HUNDRED starlings were introduced from Europe into Central Park in New York City in 1890-1891. It was expected that this bird would help in the control of insect pests. In the sixty odd years since that date this bird has swiftly grown in numbers and regions until today starlings are considered a first rate pest in most cities. Great flocks of these birds will return to the trees in a city at sundown where they "whitewash the streets, sidewalks, and cars" from their roost in trees. Many different methods have been suggested and applied to reduce the obnoxious effects of such starling invasions. The following account of one particular method should prove helpful in other cities where the birds require control.

Champaign and Urbana are the twin cities housing the University of Illinois and total about 70,000 persons. The rich farm land outside of these cities provides feeding grounds for large flocks of starlings which swarm into the many trees of the cities every evening in early fall. The numbers have increased yearly until 1954 when it became impossible to park cars outside in the evening or to even walk along the sidewalks. Mr. Fred Simmering, president of the Urbana Association of Commerce, started the drive against the birds at the request of residents in an area east of the campus. He called the Electrical Engineering Department of the University of Illinois for technical information and the following method of attack began.

A number of birds were collected and taken to the Speech Research Laboratory of the University where Mr. Virgil Krone made a recording of the cry of a starling in fear and fright. A natural cry was obtained since the starling was fighting with a blackbird, a natural enemy, and the starling was also restrained by a string on its leg. The recording was made with professional quality tape at 15 inches-per-second from the soundproof recording room of the Speech Research group. A slight boost was applied to the high frequency response to catch all important components of the bird's cry. The best section of the master copy was transferred into a loop copy which was then repeated until a six minute tape was formed. The low frequency range was cut with a special filter in the copy process to remove unwanted sounds of breathing, wing beats, and footsteps.

The copy tape was given to Mr.

Larry Stewart, station manager of the local CBS radio station, WDWS. He arranged a free spot in the early evening for the broadcast of the tape. The local radio stations and newspapers carried advance notice of the special public service broadcast for several days before the broadcast time. The tape was played in its first length for one evening and several observers reported the actions of the birds. The public response in the region where the starlings were very troublesome was almost 100 per-cent. The author and Professor W. G. Albright toured the general region with the small General Radio Survey Meter; the level averaged over 70 db in the street, a figure slightly below that mentioned in the Penn State College tests (80 db in the tree level). A region of six by eight blocks had very good coverage.

It was estimated that an average of 20 radio receivers for each city block would give the minimum uniform level if these radio receivers were directed to the trees. Many of the houses in the zone are student rooming houses with a large number of radio receivers in each house; one lady reported 27 radios in operation at her house. It should be noted that sound truck systems would be of help in this plan but the use of a large number of household receivers is the key to uniform coverage of a large area. It was hoped that the regions outside the "Starling Park" would join the drive so the birds would fly back to the country. The relative cooperation seemed to be almost in direct proportion to the number of birds in the block; it should be noted that these regions received many birds during the program period and the birds remained in the new regions until winter chills came to drive the birds away for this year.

The observers reported the birds were greatly disturbed during the first test broadcast but the length of the period was too short for effective action. Dr. C. S. Kendeigh, ornithologist of the University, gave several helpful tips about bird habits and general help in the project. It was planned to play the cry for fifteen-minute periods on four evenings since the Penn State tests had indicated repeated applications were necessary for complete control.

These additional broadcasts were made in the following week during the time when the greatest number of persons would be at home. The series of

four broadcasts seems to have driven the starlings from those areas where full public cooperation was given. The local newspapers ran several reports by residents: "—had thrown the birds into utter confusion." "For the last few nights I have not seen one starling." "It's like heaven now." "The broadcasts have completely removed the birds." "—made a very big difference."

A general survey of the two cities was made several weeks after the four broadcasts to check the lasting effect of the program. It was noted that a very few birds did return to the core area but in nowhere near the number roosting there before the broadcasts started. There were some birds in the regions where the public did not cooperate but these were judged to be no more than the number before the broadcasts. The South Campus region seemed to have an increase in its bird population; since there is no housing in that general region this condition is expected. Large flocks were also noted in North Champaign where scattered conditions may have prevented satisfactory coverage of some regions.

The following suggestions are offered to other cities which face the starling problem:

1. Obtain by some means a suitable tape or disc record of the fear-cry of the starling. Arrange to have your local broadcast station play this for fifteen minute periods on four evenings.

2. Papers and radio stations should carry a strong publicity advance on the program. It is very important that the public be aware of the need for full cooperation over all regions where the birds could roost. Explain that small radios will be quite directional over these high frequency sounds so table radios should be placed in open windows. Console radios will help to fill the general background and should be used.

3. Modulation should be full and radios should be turned to full levels during the program. Voice instructions may be given at background levels during the program. Warn the public to reduce the gain at the end of the program. Give pep-talks during the program so the public will check their neighbors.

4. Arrange for sound trucks to cover park regions and downtown regions where radios are not available. Some stores have p.a. systems for Christmas music which could be used for shopping regions. Auto radios will also help to cover those regions where residential radios are not available. We did not try auto horns or shotguns as additional noise makers because the fear-cry is considered to be most effective when used alone.

5. Follow up the program every day with reports from observers as to bird actions and numbers.

6. Arrange to protect animals which might become frightened by the strange cry; most family dogs do not seem to mind the sounds but there are reports of zoo animals showing great fear if the level is high.

-30-

BELGIUM PLANS LOFTIEST TV ANTENNA STRUCTURE

By G. DE BRABANDER
Brussels, Belgium

THE Belgian Cabinet has recently agreed to give serious consideration to a project for the construction of the loftiest building in the world: a tower 1760 feet high. The idea for the project is credited to Professor G. Magnel of the Ghent University.

The tower will be composed of two main parts. The lower part will be a truncated cone, 1350 feet high, surmounted by a cylindrical cap 150 feet tall. It will be built of prestressed concrete and its summit will be 1500 feet above the level of the ground.

By way of comparison, the TV mast atop the Empire State Building in New York extends 222 feet above the main structure which measures 1250 feet from the street level.

The upper part, topping the first, is to be of light metallic construction, 500 feet high. It will have to bear the television antennas, which will extend to an altitude of 2100 feet. The Heysel, near Brussels, where it is proposed to build the tower, is about 210 feet above sea-level. The highest ground in Belgium is only 2000 feet above sea-level.

Professor G. Magnel has declared that the concrete cone will be based on nearly 1500 piles. Its diameter near the ground will measure 300 ft. and the thickness of its outer wall will not exceed 15 inches. The diameter of the cylindrical cap, a continuation of the cone, will measure 95 feet.

The interior of the building will take the form of a central tube connected with the outer wall by means of prefabricated cross-beams. The diameter at the narrowest part will be 33 ft. It will contain the elevator shafts.

There will be fifteen floors with plenty of space for rooms. Both the upper and lower parts of the tower will house the two Brussels television stations (French and Flemish) with their complete equipment, from studios to antennas, besides their clerical staffs. These studios will be several times larger than the cramped rooms which are at present at the disposal of the television services.

Three or four floors will house the new "Science-Palace," a school for radio-communications and several auditoriums.

The construction of the tower will take at least three years. If no major difficulties arise, building will start this year. Nearly eight hundred craftsmen, technicians, and specialists will be employed.

The cost of the fabric, it is estimated, will be nearly 70 million pounds (\$196 million). The finished building will cost nearly as much again and the maintenance costs will run into thousands of pounds annually.

The real purpose of this gigantic building, in addition to serving as a carrier of the television antennas, is to provide an additional attraction for the Brussels International Exhibition, to be held in 1958. The inauguration of the tower is planned for Spring of that year.

It is expected that in 1958, 3 million visitors will call at the tower. All expenditures must be defrayed by admission money, and when the Exhibition closes in 1959 it is hoped that visitors will still be numerous enough to pay the cost of upkeep.

-30-

June, 1955

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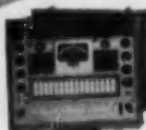
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HARMONIC CANCELER AMPLIFIER



Over-all view of the author's home-built canceler amplifier. It is a compact and inconspicuous unit.

By PHILLIP W. LEE

A novel method of canceling second-harmonic distortion from single-ended type amplifiers. Since the design applies solely to low-power units, its application is ideal for table model TV receivers and small radio sets.

THE HARMONIC canceler amplifier to be described in this article is designed especially for low-powered applications. You can enjoy good quality reproduction for little more than you would expect to pay for a simple single-ended audio amplifier. The harmonic canceler amplifier gives you top tone quality and excellent transient response. The frequency response is exceptionally good. With a high quality output transformer and a sacrifice of over-all gain, as was done in this design, the over-all response is flat from 50 cps to 20 kc.

The harmonic content of this amplifier is less than one per-cent at full output. It, just like push-pull amplifiers, cancels the even-ordered harmonics generated by the tubes. In push-pull we use two tubes in every stage, usually two triodes. The grid input signal voltages of the two tubes are equal in magnitude but opposite in phase. The out-of-phase grid driving voltages of the push-pull amplifier drive the two tubes oppositely and compensate for the curvature of the grid-voltage-plate-current curves. The push-pull amplifier could cancel most of the nonlinear distortion found in tubes operating alone. To reduce distortion to the smallest possible amount, balanced operation is necessary. Ordinarily, a push-pull amplifier will cost about three times as much as a simple single-ended audio amplifier. This is what keeps push-pull from being applied to countless radio and television sets.

The harmonic canceler amplifier, just as in a push-pull amplifier, uses the curvature of the dynamic curves (grid-voltage-plate-current curves) of two tubes to act against each other resulting in an over-all linear characteristic, only in the harmonic canceler

the canceling of distortion occurs between stages in series instead of between tubes in parallel stages.

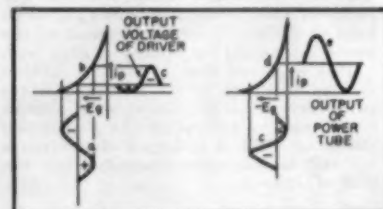
Theory of Operation

Fig. 1 is the graphical analysis of the harmonic canceler amplifier. In the graph, *a* is the signal input voltage of the driver tube, *b* is the dynamic curve of the driver, *c* is the output waveform of the driver, *d* is the dynamic curve of the power tube, and *e* is the output waveform of the power tube. After the signal voltage is amplified by the driver, it is distorted. This distorted, amplified signal voltage is then fed to the power tube. The power tube again distorts the signal voltage but in an opposite way. The distortion introduced by the driver is thus at least partially removed from the output. The only limitations of fidelity within the amplifier are the odd harmonics and the correctness of balance.

Circuit Consideration

As shown in Fig. 2, the input terminals of the harmonic canceler amplifier are shunted by a one megohm potentiometer. The plate load resistor is 10,000 ohms for the preamplifier. The reason for the relatively low value of this resistor is because if too high

Fig. 1. Graphical analysis of the harmonic canceler amplifier, explained in article.



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If you have an inquiring mind, an open mind, why don't you consider your future in electronics? Obviously we cannot supply you with all the answers to the questions asked above. (Some of those subjects are near the threshold of present-day science.) But we can supply you with modern, up-to-the-minute education which will enable you to grow with electronics.

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June, 1955

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SCHOOL
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FM RECEIVER

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BC-923 RECEIVERNEW: \$34.95

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BC-221 FREQ. CASE—Aluminum Case for BC-221 or TS-164 Freq. METER—W/Voltage Regulator Supply using 1-VR-105—2-Ballast Tubes, Relay, Cable, etc. Front Comp. 6 1/2" x 7 1/2" x 7 1/2". Rear Compartment 2" Deep. Shock-mounted. NEW: \$4.95

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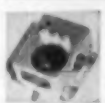
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			USED: NEW:
14 VDC	330	150 BD-67	8.95 15.95
14	250	50 DM-25	6.95 8.95
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14	1030	250	
	515	215 DM-42	8.95 12.95
28	1000	350 PE-73	8.95
12 or 24	275	110 USA-0916	4.95
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TRANSMITTER T-121—3.5-4 MC.; 50 Watt Crystal Control MD. P.A. for CW. 2-12B2, 1-25L6 Tubes & Crystal. Keyer consists of 24 VDC Keyer Assy. & Code Wheel. Size: 8 1/2" x 6 1/2" x 5 1/2" w/in. structure Book NEW: \$9.95

COAXIAL - CABLE - CONNECTORS

CO-1071 CORD—With PL-250 Plugs each end. 50 ohm 2 Ft. Price: 50¢ Ea.—Lots of 10 @ 50¢ Ea. PL-250—Plug, Ea. End & 32"—RG-54/U—50 ohm. 50¢ 50-239 Chassis Conn. f/PL-250 (Removed). 3 for \$1.00 UG-21/U—Plug ea. End & 32"—RG-11/U—75 ohm. 50¢ UG-32/U—With 4" Coaxial Cable. 50¢ COAXIAL CABLE: Price Per Ft. 100 500 1000 RG-9/U 51.5 Ohm (Special) .07 .065 .06 RG-34 71 Ohms—145 Ft. Length. \$15.00 Per Leth. RETRACTABLE Cord—3 Cond. #22, 10' \$1 Ea.; 12' \$1.20



ANTENNA RELAY UNIT—BC-442 consists of switching relay, 0-10 RF Indicator, & 50 MMF Vacuum Capacitor. NEW: \$3.95

BC-375 TRANSMITTER AND TUNING UNITS

BC-375 100 Watt TRANSMITTER—Voice CW—Freq. 200-500 KC., 1500-12500 KC. by use of plug in Tuning Units. Uses 1-10Y & 4-VT-40 Tubes. Size: 23" L. x 21" H. x 9" W. Complete with Tubes. \$29.95 less Tuning Units—Price. USED:

TUNING UNITS For BC-375 & BC-191:	NEW:	USED:
TU-1—1.5 MC to 3 MC	\$5.95	\$4.95
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TU-8—6.2 to 7.7 MC	3.95	2.95
BC-306 Antenna Tuner	3.95	2.95
CABLES PL-64-61 or PL-59 Each End	Each: 3.75	

BROADCAST BAND RECEIVER

NAVY TYPE REC.—520 to 1500 KC. NEW: \$24.95

NAVY TYPE REC.—1.5 to MC. Less Tubes USED: 8.95

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BC-465 REC.—6 to 9 MC. W. tubes. Used: \$4.95 R-28 ARC-5 REC.—100-150 MC. W. tubes. Used: 14.95 COMMAND TRANS.—2-1-3MC. Navy-U \$13.95; N: 16.95 COMMAND TRANS.—3-4 MC. Navy Type. Used: 18.95

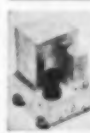
TRANSFORMERS—115 V. 60 CYCLE PRI.:

600 VCT/100 MA.—6.3 V/5 A; 5 V/3 A	14.95
600 VCT/50 MA.—6.3 V/2.5 A; 5 V/1.5 A (Rect. 6x3)	1.95
350 VCT/40 MA.—6.3 V/2 A; 5 V/1.5 A (Rect. 6x3)	1.75
2500 V/0.15 A; 2.5 V/175 A; 6.3 V/6.5 A	5.95
1000 V/12.6 MA. Tapped 2.5 V. 2 A.	5.95
1100 V/80 MA.; 7.5 VCT/3.25 A	5.95
8 Volt CT-25 A; 10,000 V. Ins. Open Frame	37.95
9 Volt CT-35 Amp. Tapped 4.5 V	7.95
12 Volt—Two separate windings—1 Amp each	5.95
28 Volt 8 Amp Tapped & Volt.	5.95
5 V/2 A; 5 V/2 A; 5 V/2 A; 5 V/2 A	2.95
600-6-600VAC—200 MA. 12.5 V. 2 A.; 12.5 V. @ 2 A.; 5 V. @ 3 A.—#H-100—Price.	8.95
250-0-250 VAC—50 MA. 24 V. 1 A.; and 6.3 V. 1 A. #H-100—Price.	3.95

CURRENT TRANSFORMER—Ratio 100 to 5: 25 to 60 cycle. W. 60 Ohm. \$4.95

CONSTANT VOLTAGE REGULATOR—115 Volt 60 cycle, 50 VA. Sola #30725 \$12.95

Choke 12.5 Hy/100 MA. \$1.05
Choke 15 Hy/150 MA. 125 Ohm. 1.95
Choke 5 Hy/150 MA., 85 Ohm. 1.50



6 VDC VIBRATOR POWER SUPPLY

RCA NJ-8—6 VDC input; output 275 VDC 80 MA w/024 Tube, 11 Ft. Batt. & Power Cable, Switch & Fused Line. 4 1/2" x 4 1/2" x 6" NEW: \$7.95

METERS:

WESTON AC AMMETER:

(Pictured) in portable leather case, with Test Leads, 2 1/2", 0-15 AC and 0-3 AC Scale. \$5.95

DC AMMETER HOYT: in portable metal case, with Test Leads, 4 1/2", Fan, Mirrored Scale 0-15 ADC. \$4.95
0-3 RF AMMETER 18-120 MC. 16 SW. 2.95
50 Amp RF w/Thermopile 18-80; 2 1/2" Rd. 4.95
0-15 AC-DC—2 1/2" Rd.; 18-122 4.95
0-500 MA DC—2 1/2" Rd.; 18-22 4.95

TG-34A KEYS

NEW—\$16.95

TG-34A KEYS—115 or 230 V. @ 50 to 60 cycles—an automatic unit for reproducing audible code practice signals previously recorded in ink on paper tape. By use of the self contained oscillator, the unit will provide code practice signals to one or more persons, or provide a keying oscillator for use with a hand key. Unit is compact, in portable carrying case, and complete with tubes, phono cell, and operating manual. Size: 10-0/10" x 10 1/2" x 15-13/16". Shipping weight: 45 lbs. NEW—While They Last— \$16.95

TG-10 KEYS—Same function as TG-34A described above—only larger—Using 2-6N7, 2-6SL7, & 1-6U6 Tubes and 1-923 Photo Cell. Housed in standard Metal Cabinet, can be removed for 10" rack mtg. Size: 11" H x 24" W x 18 1/2" D. Price—USED—TESTED—Only \$17.95

SELSYN

115 VOLT 60 CYCLE. Synchronous Transmitter C-78414. 5" x 3 1/2" Long Leads w/Bracket Removed from New Equip. PAIR: \$15.00



BEACON RECEIVER

BC-1206 CM—200-400 KC., Selsyn Carlson, operates from 24-28 VDC, 5 Tubes, 135 KC IF—Size: 4" x 4" x 6". NEW: \$9.95



BLOWERS:



12/24 VDC-AC CAST ALUMINUM BLOWER—100 CFM; 3" intake; 2" outlet. Blower Motor 4" x 2" 3000 RPM \$5.95 @ 24 VDC.

115 VAC 60 CYCLE SINGLE TYPE—100 CFM; 2 1/4" intake; 2" outlet. Complete Size: 3" x 6" No. 1C59 \$8.95

115 VAC 60 CYCLE DUAL TYPE—100 CFM; 4" intake; 2" Dia. Each Side. Complete Size: 8" x 6". No. 1C80 \$13.95

115 VAC 60 cycle COMPACT TYPE—105 CFM; Motor built inside squirrel cage; 4 1/2" intake; 3 1/2" outlet. Complete Size: 8 1/2" x 6 1/2" D—No. 2C057 \$14.50

115 VAC 60 cycle FLANGE TYPE—100 CFM; 3 1/2" intake; 2 1/2" Dia. Complete size 7 1/2" W x 7 1/2" H x 6 1/2" D—No. 1C807 \$13.95

115 VAC 60 cycle FLANGE TWIN—275 CFM; 4 1/2" intake; 3 1/2" x 3" Dia. Complete size: 11 1/2" W x 8 1/2" H x 8-1/16" D—No. 2C085 \$21.95

115 Volt 400 cycle—10 CFM, Eastern Air Devices Motor J31A—7200 RPM; 1/100 HP. L-R #2 Blower Assy. Overall Size: 4 1/2" x 3 1/2" x 3 1/2". No. 3110. \$5.95

115 VOLT 60 CYCLE BLOWERS:

6VDC SINGLE—100 CFM—No. 8108 \$4.95
6 VDC FLANGE—150 CFM—No. 8100 6.95
12 VDC SINGLE—10 CFM—Min.—No. 1279 7.95
24 VDC SINGLE—10 CFM—Min.—No. 2410 5.95
24 VDC DUAL—20 CFM—Min.—No. 2420 7.95



MAGNETRON MAGNET

HEAVY DUTY PM MAGNET—Approx. 2000 Gauss—8 1/2" x 7 1/2" x 2 1/2". 1 1/2" gap. 10 1/2" lbs. Removed from New Equip. \$5.95

CLASSIFIED ITEMS:

BC-212G Amplifier—2 6CS	N: \$3.95; U: \$1.95	
BC-216A Amplifier—6F7 & 30/44	U: 1.95	
BC-229/429 REC. 2500-7700 KC., W/Coils	U: 5.95	
BC-230 TRANS. 2500-7700 KC., W/Coils	U: 8.95	
BC-347 Amplifier—1-6ES6	N: \$3.95; U: 1.95	
BC-357 Marker Beacon RECEIVER—75 MC.	U: 3.95	
BC-357 Amplifier—2-6V6GT	N: \$4.95; U: 3.95	
BC-463 TRANS. & MODULATOR—67 to 74MC.	U: 16.95	
BC-654 TRANS. & RECVR—3000 to 5000 KC.	U: 24.95	
BC-709 Amplifier—Batt. Op.—1 tube; N: \$3.95; U: 2.95		
BC-748 TRANSCEIVER—3 to 6 MC.	U: 14.95	
BC-866 IFF SET—160-211 MC.—13 Tubes	U: 5.95	
RI-ARR-1 RECEIVER—Conv. 2 or 6 Motors	N: 3.95	
RT-7/APN-1 Attimeter	U: 9.95	
RT-34/APN-12 TRANSCEIVER—Less Tubes	U: 3.95	
FL-8A Range Filter	U: \$1.49; FL-5 Filter	U: 1.00
TS-10 Carbon Handset	U: 3.95	
TS-10 Sound Pwr. Modset or Hd & Chest Set	U: 3.95	
MP-22 MAST BASE—F/MS Sections	N: 2.95	
MP-31 MAST BASE—F/MS Sections	N: 5.95	
MP-37 MAST BASE F/MS Sections	N: 6.95	
MP-46 MAST BASE—F/MS Sections	U: 5.95	
MAST SECTIONS MS-46-50-51-52 or 53	Ea. N: .50	
MAST SECTIONS MS-54-55 or 56	Ea. N: .75	
AB-15/GR MAST BASE—F/MS-S Sections	U: 5.95	
MP-65 MAST BASE—F/MS-S Sections	U: 8.95	
MS-6 MAST SECTIONS MS-116-117-118	N: .75	

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What's New in Radio

The products described in this column are for your convenience in keeping up-to-date on the new equipment being offered by manufacturers. For more complete information on any of these products, write direct to the company involved.

TRANSISTORIZED COUNTER

The Radiation Counter Division of Transi-Mite Laboratory, Manteo, N. C.,



has developed a small, transistorized Geiger counter that sells in the moderate price class.

The "Micro" requires just a single 1.5 volt mercury cell for operation. It measures 4½" tall and weighs a pound. The counter comes complete with a miniature earset, radioactive sample, pocket-size prospecting manual, and complete operating instructions.

A data sheet describing the new counter is available from the company on request.

"Q" MULTIPLIER

Of interest to the amateur fraternity is the announcement by Central Electronics, Inc., 1247 W. Belmont Ave., Chicago 13, Ill., of the availability of its new Multiphase "Q" Multiplier.

The new unit is a tunable i.f. electronic filter that provides tremendous receiver selectivity for either peaking or rejecting an AM, c.w., or SSB signal. The selectivity is continuously variable from 60 cps to normal i.f. passband.

The new two-tube circuit employs a special very high "Q" pot core inductor



and the manufacturer claims up to 50 db attenuation of interfering carriers and the ability to reject undesired signals without affecting speech intelligibility.

The instrument is made in three dif-

ferent models. The Model AQ is for installation in the Model A sideband slicer and includes a new front panel and power cable to plug into the accessory socket. The Model DQ is a desk model which can be connected to any receiver having a 450-500 kc. i.f. frequency. The third model is the combination Model A sideband slicer and "Q" multiplier which has been designated as the Model B.

TINY ALLIGATOR CLIP

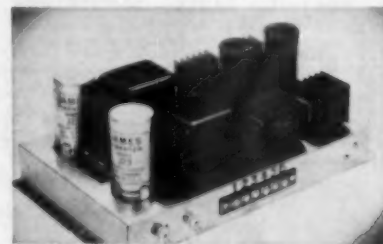
Mueller Electric Co., 1583H E. 31st St., Cleveland 14, Ohio, has developed a miniaturized alligator clip which it claims is the smallest ever made.

The new steel or solid copper clip is completely insulated by a vinyl plastisol sheath-type insulator. Designed for quick, temporary connections in miniaturized and subminiaturized equipment, the clips are adaptable to many uses.

A data sheet providing full details on the line is available on request.

MOBILE POWER SUPPLY

James Vibrapower Company, 4036 N. Rockwell St., Chicago 18, Ill., is cur-



rently marketing a new mobile vibrator power supply, the Model C-1050.

The supply is intended primarily for amateur mobile installations but will have many other applications where high power is required for mobile equipment. The unit has a maximum power output of 95 watts at 450 volts. It is equipped with a low voltage transmitter and reserve voltage tap and has an incorporated receiver muting relay.

This unit will operate on either 6 or 12 volts by minor tap changes. The same standard heavy-duty, 4-prong vibrators are used for either input voltage. The supply is available in either wired or kit form.

5-INCH SCOPE

Hickok Electrical Instrument Company, 10524 Dupont Ave., Cleveland 8, Ohio, is in production on a new, wide-range 5-inch scope which has been especially designed for industrial electronic engineering applications.

The Model 770 offers a frequency range of d.c. to 2.5 mc. with the vertical amplifier bandwidth switch in the narrow position and from d.c. to 5 mc. in the wide position. Horizontal amplifier bandwidth is d.c. to 500 kc., the sweep circuit oscillator covers from 2 cycles to 30 kc., while the fixed sweep frequencies cover the band from 30 cycles to 7875 cycles.

The instrument features an illuminated, calibrated screen backed with a green filter for reducing incident illumination in the room.

For full specifications on the Model 770, write the company direct.

TRIO "99"

Trio Manufacturing Co. of Griggsville, Ill., has just introduced its "99" antenna which has been designed specifically for Channels 2-13.

The new unit uses two dual-purpose active elements, each consisting of three half-waves in-phase on the high channels and, at the same time, a single half-wave on the low channels. To this is added a combination of three parasitic elements on the low channels and five on the highs.

The manufacturer claims high forward gain and maximum side-rear rejection as a result of more critical element lengths and spacing. The "99" is constructed of high-strength *Alcoa* aluminum, is preassembled, and uses the company's "InstaLok" clamps for quick, easy, and positive installation.

WEATHERPROOF COATING

The TV Tower Division, Kuehne Manufacturing Company, Mattoon, Ill., has announced that its line of TV towers is now being produced with a durable zinc finish bonded to the steel by electroplating for a permanent, high-lustre finish. The towers are now said to be completely rustproof without painting. If, however, painting is desired to match exterior color schemes, the zinc finish provides a good base coat.

(Continued on page 104)

BETTER PICTURES FROM OLD PICTURE TUBES



The Miller #6295 Adjustable Ion Trap is made to replace any single ion trap with gausses from 32 to 55. Most old picture tubes would give better pictures if the old ion traps were replaced and adjusted to proper gauss.

This Miller #6295 Adjustable Ion Trap, like all 850 Miller television and radio replacement parts, is unconditionally guaranteed. These adjustable ion traps may be bought singly or in an attractive counter display carton of 24 units.

Catalog No.	Description	Net Price
6295	Adjustable Ion Trap	.75

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June, 1955

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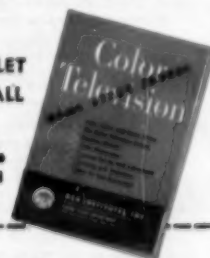
Because of its highly specialized nature, this course is offered only to those already experienced in radio-television servicing. Color TV Servicing will open the door to the big opportunity you've always hoped for. Find out how easy it is to cash in on Color TV.



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DEPT. RM-6-55

Without obligation on my part, please send me a copy of your booklet on the Home Study Course in Color TV Servicing.

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Culver City, Los Angeles County, Calif.

The design of the towers will continue to incorporate the firm's exclusive lateral load-bearing joints and the grid-around cross ties which permit the tower to stand free up to 50 feet in gales up to 80 m.p.h.

ELECTRONIC ORGAN KIT

A complete electronic organ in the form of build-it-yourself kits has been



introduced by *The Schober Organ Corporation*, 35 Dail St., New Hyde Park, N. Y.

The organ can be built by a complete novice, yet is a full concert instrument with two manuals, 32 pedals, 19 stops, and 6 couplers, suitable for use in the home, a church, or an auditorium.

Operation is completely electronic, with no moving parts except the keys and controls. Among the features which make construction simple and technical knowledge unnecessary are 130 printed circuits. Kits for the separate components, such as each of the 12 tone generators, or preamplifiers, stop filters, etc., may be purchased separately to make budgeting easy.

Console, keys, pedals, and bench are especially designed as fine furniture to lend a professional appearance to the completed instrument.

A booklet containing full data on this organ kit is available from the manufacturer on request.

RAYTRONIC "BEAMER"

Raytronic Laboratories, Inc., Cincinnati, 15, Ohio, has recently introduced its "Beamer" unit which is designed to positively check, by direct reading, the gas content of any picture tube.

The gas pressures in the picture tube are measured by using the picture tube as an ionization gauge and the "Beamer" as a source of control voltage and current indication.

Operation is straightforward and positive. Designed especially for service operators and technicians, this new instrument gives a positive picture of CR tube life.

SWEEP CIRCUIT ANALYZER

A new TV test instrument for color or monochrome, designed to troubleshoot horizontal and vertical deflection circuits, has been introduced by *Winston Electronics, Inc.*, 4312 Main St.,

WANT POWER & VERSATILITY?

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KIT
\$29.95

Wired
\$38.95

6V & 12V BATTERY ELIMINATOR & CHARGER #1050

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- charges 6V and 12V storage and Edison Batteries.
- operates mobile and marine receivers, transmitters, boat lights, electric trains, projection and other equipment.

SPECIFICATIONS

- 6-Volt range: 0-6V (up to 20 Amp.)
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- variac-type transformer for continuously variable voltage adjustment.
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For complete information, see your distributor or write

BAUMKER Manufacturing Co.
3865 SUMMIT STREET TOLEDO, OHIO

RADIO & TELEVISION NEWS

Philadelphia 27, Pa., as its Model 820 Dynamic Sweep Circuit Analyzer.

The unit provides 60 cycles of vertical saw-tooth, 15 kc. horizontal saw-



tooth, and deflection transformer drive for both vertical and horizontal sweep circuit troubleshooting by speedy signal substitution. In addition, the instrument provides a positive test for flyback transformers and yokes, using an oscillating neon indicator in conjunction with a d.c. amplifier, making the indicator more sensitive than a meter.

The instrument is housed in a portable blue-black case with blue-grey sloping front panel.

WIRELESS INTERCOM

Semco Electronics Corp., 17 Warren St., New York 7, N. Y., is marketing a wireless intercom under the trademark "Page Boy."

No installation is required. The units are designed to be simply plugged into the house wiring. The cabinets are made of sturdy Plaskon and have suf-



ficient weight to prevent sliding. The "press-to-talk" control can be manipulated with finger-tip pressure.

The intercom is currently available in mahogany and ivory finishes.

TUNING SLUG RETRIEVER

General Cement Mfg. Co., 919 Taylor Ave., Rockford, Ill., has come out with a new service tool for the technician.

The tuning slug retriever is available in two sizes, 12" and 15". It is designed to work on all *Standard Coil* tuners where it is used to recover tuning slugs on the oscillator coils of channel strips. They are also said to fit the new wide-slotted slug and deep-seated tuning units.

Each of the models has a precision-

SALE YOU'LL SAVE "APLENTY" SALE AT AIREX

New Low Price on Our 30 Tube 27 Inch TV Sets Up to 200 Miles Reception Perfect Performance

• High Gain Cascade Tuner • Fringe Area Control • AGC Control • 90° Deflection • Channel-Locks Picture and Sound • No Drift Operation • Molded Plastic Condensers • 20 KV H.V. Power Supply • Photo Connection and switch • 4 Microvolts Sensitivity.

630-FA-9 for Custom Installation

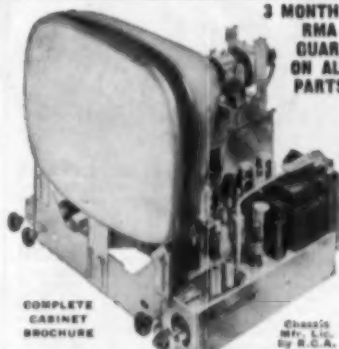
- | | |
|---|---|
| (1) 630 FA9 chassis | (1) 630 FA9 chassis |
| (2) 24" Sylvania aluminumized silver screen | (2) 27" Sylvania aluminumized silver screen |
| (3) Heavy duty tube mounting brackets | (3) Heavy duty tube mounting brackets |
| (4) Knobs, ion trap, hardware, etc. | (4) Knobs, ion trap, hardware, etc. |

\$21495

with 12" RCA Spkr.

\$23995

with 12" RCA Spkr.



3 MONTHS
RMA
GUAR.
ON ALL
PARTS

SENSATIONAL NEW GRANCO FM RECEIVERS & TUNERS

FM RECEIVER-MDL 610: 6 tubes plus rectifier, built in antenna, RF stage, hi-fi speaker. Plug in and play. Complete with cab. **\$2995**

FM TUNER-MDL 1100: 6 tubes plus rectifier, built in antenna, RF stage. Plug into your present hi-fi amplifier. AC only. Built in phono-FM Switch. Complete with cab. **\$3495**

CUSTOM MADE 10 WATT HI-FI AMPLIFIER

Here is the perfect amplifier for a budget installation. Push-pull 6V6 output tubes, 60C7 pre-amp for resistance cartridges, 6SL7 phase inverter and 6X3 rect. Power output 10 Watts. Less than 1% distortion. Frequency range 20-20,000 cps ± 1 db. Separate base and treble control, 4, 8, 16 ohm output taps. Size 8x7x5". **\$23.95**

EASY-TO-BUILD TV KIT

Here is your opportunity to make a television set at an unbelievable low price. New Vertical chassis design saves 50% space requirements of conventional sets. Complete with 14 tubes, all parts, step-by-step instruction manual, large wall mounting diagrams. Send today for your TV kit. Knowledge of television is not necessary. Cable nets available. Illustrated folder. **7995**

SENSATIONAL TV TUNER VALUE

Here is your chance to get in on a special purchase of **NEW TURRET TV TUNERS**. Because of this low, low price, we can't give the mfr's name. Complete with 636 and 6AG5 tubes. Built-in wave trap, removable channel strips, positive click stop. Shaft length 2 1/2". For 21 MC IF circuit. An ideal replacement for all sets. **\$6.95**

RMS "Rotor Queen" Antenna Rotator

Weather proof, Aluminum. Full 370° left or right rotation. Oilite bronze bearings. Control box has finger tip action (compact mahogany case). H.S. **\$13.95**

THRUST BEARING: Up to 500 lbs. additional support. Keeps mast rigid. **\$3.95**

3 CONDUCTOR CABLE: For rotator. 3c per foot. 100 ft. **\$2.50**

REAR AUTO SPEAKER KIT

Complete with speaker, metal grill, metal protective screen, 3 way switch, wire, acousticon, plate knob and full instructions. **\$4.95**
Size 5 x 7 **\$5.75**
Size 6 x 6

We have in stock the largest selection of Hi-Fi equipment & speaker enclosures at low, low prices. Send us your requirements. Immediate reply.

All merchandise is brand new, factory fresh & guaranteed. Mail & phone orders filled on receipt of certified check or 50% of items as a deposit. Balance C.O.D., P.O.D. factory M. V. Prices & specifications subject to change without notice.

AIREX RADIO CORP., 171 Washington St., N. Y. 7 CO 7-5218

AUTO-FOCUS 30-TUBE 630-FA-4

• Up to 200 miles reception • Pictures always in focus • Hi and Low sym. Amplifier • Channel-Locks picture and sound together • Automatic Freq. control • Gated A.G.C. • Full 4 MC Picture Bandwidth • Photo connection and switch • Efficient Retrace Blanking • Full Focus Cosine Yoke • Molded Plastic Condensers • 6CH6 Tubes in Video I.F. • Handles up to 21" • Autoformer Fly Back • Heavy duty power transformer • 4 Microvolt Sensitivity • Ready for UHF stations • 22" x 22" x 24" with 31" tube mounted.

\$14995

With 12" Hi-Fi RCA speaker. Less CR tube & brackets. Tube mfg. note. \$6.95.

Detailed Service Manual for FA 4—\$1.00
Send for **FREE HI-FI Parts Catalog**

TV PICTURE TUBES

Nationally Known Brands. Aluminumized TV Tubes.
New. Full 1 Year Guarantee.
• 21" Tube \$34.95
• 24" Tube Rect. \$59.95
• 27" Tube Rect. \$74.95

SENSATIONAL CHANGER BUYS WEBSTER • VM • GARRARD

WEBSTER NEW 140: 3 speed internal, new Rosette hi-fi cartridge, dual sapphire styl. Automatic Shut Off. **\$24.97**
VM TRIOMATIC— 3 speed internal. **\$23.87**
WEBSTER 1121: 3 speed, 4 pole motor, GE RFX 050 cartridge. **\$29.50**
GARRARD RC 80: 3 speed automatic shut off. 2 plug in heads. **\$42.95**

TRIPLE PLAY CARTRIDGE, 499 Type GE RFX050

Reluctance triple play cartridge complete with dual sapphire needles. An excellent replacement cartridge for all types of changers and pickups.

RECORD CHANGER BASES & BOARDS
Bases—\$3.49
Mounting Boards—\$1.87
For VM, Webster & Garrard changers. Give model.

45 RPM RECORD SPINDLES
VM. \$2.60 Garrard. \$2.99 Webster. \$3.99

Combination Intercom-Baby Sitter

For home, office and factory communication. Operates up to 1000 ft. 8 1/2" x 5 1/2" x 4 1/2". Powerful 3 tube amplifier. Complete with 60 ft. hook up wire. Just plug in and use. **\$15.95**

Nationally Known Recording Tape

7" reel, 1250 ft., red oxide plastic. Lots of 12 \$1.60 in lots of 3 1.76
LP 7" reel (1650 ft.) Mylar Tape. 601—\$4.79

IMPROVE YOUR TV SOUND QUALITY

Push-pull amplifier for all TV sets using 6K6 or 6V6 in output. No wiring. Better tone. Higher output. **\$12.95**

TELESCOPIC 40 FOOT MAST **\$16.50**
Complete with hardware.

IN DETROIT IT'S AARON A REAL SCOOP—6 METER TRANSMITTER



FREQ. 53.3 TO 95 MC. 50 WATTS
Complete RF amplifier section with coils, tuning condensers and 8-815 tubes. (Tube line up) 815 xtal cond., and buffer, 815 triodes, 815 final. Can be converted for 3, 10, 15, meter, or be used as an exciter unit for higher power RF amplifiers. Tubes alone worth much more than asking price of—**\$14.50**
New in original sealed carton, 8 1/2 x 10 1/2 x 2 1/2 in. **2 METER OUTBOARD OSCILLATOR** or antenna matching sect., in place of balun, unit consist of 815 tube, ceramic split stator cond., silver mica trimmer 1 to 12 mfd., and knob. New in 2x3 1/2 metal box. Unit removed from R-2000 transceiver **\$1.25**
40 WATT MODULATION TRANSFORMER 616 to go with 815s with matching driver, mike, and tone XMPR combination deal all four. 8 1/2 x 10 1/2 x 4 1/2 in. **\$5.95**
Individually—modulation XMPR **\$3.95**
Driver, mike, or tone **\$2.50 ea.**



BC-221 FREQ. METER
Aluminum case—7 1/2 x 4 1/2 x 1 1/2 in. On shock mount. Also has 1. voltage reg. tube VIL 100, 2, 216 amperes, 1. 210 V. pilot light bulb, 1. 160 OHM relay, 1. 1 MFD .05 200 VDC cond. and ext. power supply cable. With installation instruction. It's a beautiful black crackle case for your old BC-221 FREQ. meter, 8 1/2 x 10 1/2 x 1 1/2 in. New in original carton only **\$5.95**

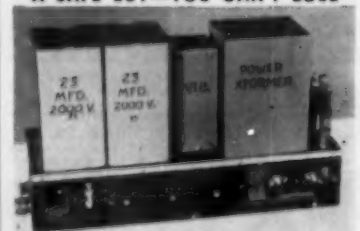
BC-221 TECHNICAL MANUAL—NEW, Prepaid \$1.25
BC-929 SCOPE INDICATOR AS PICTURED



Build your scope on this foundation. Originally operated on 110 V. 400 cy. This scope has been demilitarized to the extent that only the 400 cy. Xmr's and tubes are removed, but has all the basic elements for a first class lab. instrument. Has extremely high vertical and horizontal sensitivity and a wide range bandwidth for TV use. Has all controls for vert. centering, horiz. intensity, focus, horizontal and vertical amplitude and sweep duration. Plus—3 inch tube shield, with a 14 pin socket, 5 so, 239 amplifiers panel plugs, all condensers. **\$3.95**
With 21D11 tube **\$5.95**

STROBOSCOPIC PHOTO FLASH 100 W. SEC. 100% SATISFACTION

Or your money back in 3 days. If you pay rail-way express charges to your destination and return. **A SAFE BUY—YOU CAN'T LOSE**



This stroboscopic flash outfit operates on 12/24 VDC source, but can be converted to its original use of 110 VAC for a few dollars. Ideal for studios, industrial, lab., or any type of photography. You will save at least \$25.00 by purchasing this photo-flash, complete with 200 v. sec. Xenon photo-flash bulb similar to R. 4389, Stroboscopic hand light sec'y, ignition coil, trigger housing, cord, and manual. New in original carton. **\$39.50**
Sh. wt. 50 lbs.

TERMS: 25% deposit with order—balance COD all shipments FOB Detroit. Note—Save COD charges by remitting full price and allow for postage.

AARON ELECTRONICS

Dept. 5, 3830 Chene St., Detroit 7, Michigan

made alloy blade and Tenite handle. In addition to slug retrieving, the tools can be used to reclaim screws and to start set screws in previously inaccessible spots.

INDUSTRIAL TV CAMERA

A new type of portable and streamlined industrial television camera chain, designed for simplicity of operation by non-technical personnel, has been introduced by General Precision Laboratory of Pleasantville, N. Y.

The new camera chain plugs into any standard 115 volt line, uses any



type of home receiver as a viewing monitor, and can be controlled and monitored from points up to 1000 feet from the pickup point.

The camera is built around a "Staticon" tube, a pickup tube only 6" in length and 1" in diameter. The system is the standard 525 line, 60 fields interlaced. Lenses are 16 mm cine motion picture type.

The chain consists of two units—a 5-pound camera and a 26-pound unit housing all controls, power supply, and sync generator. Complete technical data on this device is available from the manufacturer on request.

EMC TUBE TESTER

Electronic Measurements Corporation of 280 Lafayette St., New York 12, N. Y., is in production on a low-cost tube tester, the Model 208.

The new tester will check all octal, loctal, miniature, and noval base tubes



for tube quality as well as shorts, leakages, continuity, or opens between any two elements of the tube irrespective of the location of the defect.

A flexible switching system assures



Replacement Needling You?

TRY THE

Walco Packaged

SERVICE PLAN

Service men go for Walco's packaged phonograph needle replacement plan because it's so easy to understand and put to work. No headaches trying to figure out which needle for which cartridge—two easy guides figure for you. And you don't have to be a salesman to sell replacement—even to sell profitable diamond needles—Walco sells 'em for you, by proven methods learned in our long experience as leaders in the replacement needle industry—and as originators of the modern jewel tip needle.

Get all the information—see how much easier it is to sell and service with Walco

SEND FOR WALCO'S CATALOG 600

Walco

TRADE NAME OF
ELECTROVOX CO., INC.

Leaders in Replacement Needles

60 Franklin Street, East Orange, N. J.



**NOW
COYNE
TRAINS YOU
IN SPARE TIME
AT HOME**

TELEVISION RADIO-ELECTRONICS

Only from famous COYNE do you get this modern up-to-the minute TV Home Training. Easy to follow instructions—fully illustrated with 2150 photos and diagrams. Not an old Radio Course with Television tacked on. Includes UHF and COLOR TV. Personal guidance by Coyne Staff. *Practical Job Guides* to help you EARN MONEY QUICKLY IN A TV-RADIO SALES AND SERVICE BUSINESS—part time or full time. COSTS MUCH LESS—pay only for training—no costly "put together kits".

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RADIO & TELEVISION NEWS

complete tube testing of all present and future tubes. Incorporated in the Model 208 is a visual line voltage check to insure accurate testing.

Individual sockets are furnished for each tube type to eliminate possible prong damage. To further lessen the chance of prong damage, all elements are numbered according to pin numbers in the RETMA base numbering system.

TV ANTENNA SWITCH

Superex Electronics Corporation, 4-6 Radford Place, Yonkers, N. Y., has



added the Model UV-1, u.h.f.-v.h.f. antenna switch to its line of TV accessories.

The Model UV-1 features silver-plated switch contacts, positive indexing, no measurable signal loss, and an attractive case with out-of-sight mounting brackets.

The new unit may be used for u.h.f.-v.h.f., v.h.f.-v.h.f., u.h.f.-u.h.f. antennas as well as for color.

GEIGER COUNTER KIT

Uranium Prospecting Equipment, 13833 San Antonio Drive, Norwalk, Calif., has developed a compact, low-cost Geiger counter kit which is being marketed as the Model 210.

The kit comes complete with all necessary parts including tubes, twin headset, batteries, choke, capacitors, resistors, switch, aluminum housing, punched chassis, carrying strap, and hardware. No drilling, machining, or painting is required. Only household handtools are needed to assemble the kit. Step-by-step assembly instructions are included.

For those who would rather buy a completed unit, a factory-wired version of the Model 210 is also available. Write the company for full details on either model.

NEW LIGHTHOUSE TUBE

The Tube Department of General Electric Company, Schenectady 5, N. Y., has developed a new lighthouse triode which operates up to 4000 mc.

Designed for military and industrial c.w. and pulsed power applications, the new type GL-6442 measures only $2\frac{3}{4}$ " high and $\frac{7}{8}$ " in diameter exclusive of the grid flange. The tube is suitable for applications in beacons, communications, low-power radar, microwave relays, navigation, special test equipment, and telemetering.

June, 1955

Where Fidelity speaks best for itself!



AMERICAN'S famous Dynamic Omni-directional Microphone (D-33). "Slide-lock" device permits fast removal from stand for hand use. Attractively finished in gold and black. Available in all popular impedances.

AMERICAN Microphones

The name AMERICAN on a fine microphone represents the most advanced design in audio pickup technology . . . quality and fidelity that speak for themselves! Now another great name, Elgin National Watch Company, adds its enormous experience in design and manufacturing to AMERICAN'S to meet the increasing demands in the electronic and sound instrument field.

You can choose from AMERICAN'S complete line of Full Vision — Full Sound microphones with full assurance that your money is buying the best quality on the market . . . superb "full-sound" pickup, attractive "full-vision" styling that permits both the artist and audience to enjoy perfect performance.



Dynamic and Ribbon Cardiod (DR-330)



Dynamic Omni-Directional (D-44)



Dynamic or Carbon Hand-held (SERIES 501)



full vision...full sound

AMERICAN MICROPHONE CO.

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AN ELGIN NATIONAL WATCH COMPANY AFFILIATE

TERMINAL SETS THE PACE WITH **Sweet AND Low** **Hi-Fi PRICES!**

FM-AM TUNER



SUPER VALUE FOR ONLY \$74.50

Made by World Famous Manufacturer
of High Fidelity Components.

Has high sensitivity of 5 microvolts for 30 DB quieting on FM. Delivers 15W audio output with only 5 microvolt signal on AM. High stability circuits combined with improved Automatic Frequency Control Circuit "locks in" the FM station you want. Distortion is less than 1% of 1% at 2 volt output. Controls are: (1) Dual tone correcting volume level combined with on-off switch, (2) Fly-wheel tuning, (3) AM-FM switch. Has terminals for combination or separate FM-AM Antennas. Supplied with combination jump antenna. Cathode follower audio output permits long cables to standard high fidelity amplifiers with full range response. Tubes used are:

6CB6 RF Amplifier 6AU6 2nd Limiter
12AT7 Mixer 6AL5 FM Detector
6CB6 1st IF 12AT7 Osc. & A.F.C.
6CB6 2nd IF 12AU7 Audio & Cathode Follower
6AU6 1st Limiter 6XSGT Rectifier
6AV6 AM Detector & Automatic Volume Control

Overall Dimensions: 13 1/2" W. 7 1/4" H. 10" D.
Comes complete with all tubes, loop antenna escutcheon, connecting cable, instructions, diagram and hardware.
Quantity limited—Order now for only \$74.50



Terminal offers this
wonderful **UTAH**
Special High Fidelity
12" Loudspeaker
only **\$9.95**

Has Special CURVELINER
Molded Cone with 4 ohm
Voice coil impedance.

6.6 Alnico V Magnet with extremely small voice coil gap gives high sensitivity and handles 12 watts of audio continuously. Clear tone frequency. Response is exceedingly flat and smooth from 40 to 12,000 cps and is down only 5 DB at 15,000 cps. Many customers, visiting our Audio Dept., thought they were listening to a \$50.00 unit when they heard this amazing speaker. Buy now at \$9.95.

Use them in pairs.....3 for only \$17.95

Special quantity prices available
for HiFi and PA Dealers. Write for quotations.

MAIL ORDERS FILLED WITHIN 48 HOURS
if you cannot come to our store for this sensational value order by mail. Send full remittance or 25% deposit balance C.O.D.

Every item FULLY GUARANTEED.
individually packed in factory labeled and sealed cartons

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fine Hi-Fi Systems
at Sweet and Low prices from
Ask for Bulletin RT-5

Phone: WOrld 4-3311
Terminal Radio
COPA
85 CORTLANDT STREET, NEW YORK 7, N. Y.

A data sheet listing maximum ratings and typical operating characteristics is available from the company on request.

SLIDING-COIL RECORDER

Sound Apparatus Company, Sterling, N. J., has developed a new "Sliding-Coil Recorder" for electro-acoustical measurement applications.

The Model SL-2 records on a 2" wide chart and is a self-contained, compact portable instrument for both laboratory and field use. The device is par-



ticularly suited for measurements of reverberation, sound intensity, vibration, sound decay, and any impulse or phenomenon which can be converted into an electrical signal.

The recording scale function depends only on the taper of the input pot and this, in turn, permits a multiplicity of scale functions to be recorded.

Descriptive literature and technical data are available on request.

TRIPLETT V.O.M.

Triplett Electrical Instrument Co., Bluffton, Ohio, is now offering a new v.o.m., the Model 630-NA.

The unit incorporates six new features. It has meter protection against overload, 70 ranges, and frequency compensation up to 20 kc., providing accurate readings over the entire audio range.

Full details from the company. —50—

Spot Radio News (Continued from page 18)

this beam post will supplement the short-range radio airways which criss-cross this country, Canada, and Mexico. Conventional radio ranges do not extend over the ocean, it was noted. And, in addition, jet planes flying at great speeds cannot take the time to follow short-range paths.

The station at Camden will supply information that will enable a pilot to get continuous indication of position at all times with respect to the ground station. For a jet plane traveling at 600 miles per hour, it was pointed out, such transmission would provide guidance for a flight of five hours.

The "Navarho" station will feed data to a pilot and tell him whether he is east, north, south, or west of the station and even how far he is from the transmitter. Knowing this and his destination, the pilot will be able to plot a direct course. In larger planes, com-

Rely on POST for...

hottest values and speediest deliveries.
SEND FOR OUR NEW BULLETIN

PIONEER MOBILE DYNAMOTORS

Designed for continuous commercial service, these dynamotors are compact and efficient. Only 4" diameter for 7" long. The 100 Volt dynamotors are mounted on a filter base which contains complete A. B. and C. filters. The dynamotors have an internal cooling fan and mica brush filters. Connections are terminated in a Jones receptacle and a matching Jones plug is supplied free. Fully guaranteed.

5.5 TO 6 VOLT DC INPUT.

OUTPUT	INT.	CONT.	FILTER	PRICE
400 VDC	300 MA	175 MA	with	13.95
500 VDC	300 MA	175 MA	less	13.95

11.5 TO 12 VOLT DC INPUT

400 VDC	300 MA	175 MA	with	13.95
500 VDC	300 MA	175 MA	less	13.95

MOBILE RELAY, 6 VDC. SPST, 30 AMP CTCS PLUS EXTRA CTCT. .89 EA.

G. E. RELAY CONTROL

(Ideal for Model Controls, Etc.)

Contains a sigma magnet 2,000 ohm relay (trips at less than 2 MA), high impedance choke, bi-metal strip, neon pilot, and many useful parts. The sensitive relay alone is worth much more than the total low

price of \$1.25 Each 30 for \$9.90

STANDARD BRAND OIL CONDENSERS

4 MFD 600 VDC	.75	8 MFD 1000 VDC	1.50
8 MFD 600 VDC	.95	8 MFD 1500 VDC	1.95
10 MFD 600 VDC	1.10	10 MFD 2000 VDC	1.50
2 MFD 1000 VDC	.95	2 MFD 3000 VDC	1.50
4 MFD 1000 VDC	1.25	1 MFD 3000 VDC	1.85

3" ROUND, WESTINGHOUSE METERS

0-300 MILLS DC	.....	4.75	2 FOR 8.95
0-500 MILLS DC	.....	4.75	2 FOR 8.95
0-500 MILLS AC	.....	4.75	2 FOR 8.95
0-500 MILLS AC	.....	4.75	2 FOR 8.95

MISCELLANEOUS BARGAINS

500 mfd ceramic condensers.....	10 for .50
5000 mfd 250V electrolytic caps.....	5 for .45
100,000 ohm, 100 watt bleeder.....	.45
Kit of 45 Wire Wound resistors.....	1.50
9 ohm 100 watt Non Inductive resistor.....	1.50
350 ohm 100 watt Non Inductive resistor.....	1.50
1" miniature meters 2-2 1/2 mils.....	3.95
3" 0-5 ma dc Western Electric meter.....	2.45

Min. order 2.50—25% with order—F.O.B. N. Y.

POST ELECTRONICS CO.

98 Park Place New York 7, N. Y.



**DON'T
THROW
OLD
RADIOS
AWAY!**

Here's the data you need
to fix them **FAST** and **r-i-g-h-t!**

There's a "secret" to repairing old radios fast and profitably... and this big **RADIO TROUBLE-SHOOTER'S HANDBOOK** is it!

Just look up the old make and model you want to fix. This manual-size, 3 1/2" pound, 744-page Ghirardi handbook tells what the trouble is likely to be... and shows you exactly how to fix it. No useless testing! No wasted time! Makes it easy, even for beginners to fix old sets that otherwise have to be thrown away because needed repair data is not available.

THE ONLY GUIDE OF ITS KIND!

Cuts service time in half!

Included are common trouble symptoms and their remedies for over 4,500 models of home and auto radios and record changers. Actual case histories cover practically every model made by 202 manufacturers between 1925 and 1942—Airline, Apex, Arvin, Atwater Kent, Belmont, Ronch, Brunswick, Clarion, Crosley, Emerson, Fads, G-E, Kolster, Majestic, Motorola, Philco, Pilot, RCA, Silverstone, Sparton, Stromberg and dozens more. Gives how-to-do-it data on SPECIFIC jobs—NOT general theory. Includes hundreds of pages of invaluable tube and component data, service short cuts, etc.

.....TRY IT 10 DAYS... at our risk!.....

Dept. RH-65, RINEHART & CO., Inc.
232 Madison Ave., New York 16, N. Y.

Send Ghirardi's RADIO TROUBLE-SHOOTER'S HANDBOOK for 10-day free examination. If I decide to keep book, I will then remit the full price of only \$4.50 plus a few cents postage. Otherwise, I will return book postpaid and owe you nothing.

NAME

ADDRESS

CITY, ZONE, STATE.....

puters will do most of this plotting automatically.

The master timing unit for the station will be one of the most accurate timing devices in existence, with a required time stability of one part in one billion for twelve hours. Accordingly, a plane 1000 miles from the station will receive information accurate to within 10 miles in any direction.

If the station is a success, it will become the first in a world-wide chain of installations providing navigation aid to planes anywhere on the surface of the globe.

Currently, there are 60,000 flights a year over the ocean. Within four years, this total will jump to an estimated 90,000, underlining the need for accurate long-distance navigation aids, such as the Camden project.

ARDC HAS ALSO DISCLOSED that a transistorized digital computer has been developed for supersonic aircraft, known as "Tradic" (TRansistor-Digital-Computer), the computer requires less than 100 watts to operate; this is one-twentieth of the power needed by comparable tube computers.

(A computer of this type might be likened to the mileage indicator of a car; it's a counting machine which clocks off one number after another. Each digit shifts when the number to the right of it passes nine. Actually these computers can perform only additions or subtractions, but they are able to multiply or divide by successive additions or subtractions. There is another type of computer, the analog, which like a speedometer represents speed in terms of the angle of the pointer on the dial. This computer gives results in terms of voltages, resistance, or rotations.)

This unusual device can do sixty-thousand additions or subtractions, or three thousand multiplications or divisions a second. A typical problem fed into the machine requires it to go through 250 different steps of computation. It can run through an entire problem of that complexity and provide an answer in about 15-thousandths of a second. The computer can handle, simultaneously, as many as thirteen 16-digit numbers.

Mathematical instructions are put into the unit by means of a plug-in unit, resembling a small breadboard. Plug-in units are set up beforehand with interconnecting wires to represent problems at hand. Numbers to be processed are put into the machine by means of toggle switches.

Answers to trigonometric problems appear on a scope, via a series of dots. These dots of light move so rapidly that they appear to draw geometric diagrams on the scope screen.

The unit contains nearly 800 transistors and 11,000 germanium diodes; the latter serve as the electronic equivalent of tiny one-way switches.

AT THE NAVAL RESEARCH LABORATORY in Washington, D. C., the highest gain antenna in the world to-

Announcing!



THE NEW
HIGH-QUALITY
LOW-COST
FAIRCHILD 255
25 WATT

POWER AMPLIFIER

Here's a mighty twin to Fairchild's big-power 260 Professional Amplifier. The new 255 delivers a full 25 watts of undistorted power for the finest sound, best reproduction!

This is the ideal power amplifier for the average home or apartment. The Fairchild 255 gives you full power from deepest bass to highest treble, and an instrument especially designed for minimum transient distortion as

well as lowest IM and harmonic distortion, resulting in exceptionally true natural sound. Superbly engineered, the 255 has a controlled frequency response of +0 to -1/2 db, from 20 to 20,000 cps.

You can always restore "new amplifier" performance to the Fairchild 255, even if tubes age unequally, by Fairchild's simple, exclusive distortion-cancelling balance control.

COMPACT: Only 6" x 9 1/4" base and 6 1/2" high

INPUT IMPEDANCE: 100K

POWER GAIN: 42db

HIGH SENSITIVITY: Less than one volt input required for full output

and it's only **\$89.50**



FAIRCHILD 260
50 WATT

PROFESSIONAL AMPLIFIER

When you need full 50 watts of power, get the Fairchild 260!

This high-power instrument offers complete stability under all loading conditions — won't ring with most

severe transients! And, thanks to Fairchild's exclusive distortion-cancelling balance control, you can always restore "new-amplifier" performance.

only **\$149.50**

FAIRCHILD RECORDING EQUIPMENT

8th AVENUE AND 154th STREET, WHITESTONE, NEW YORK

MAKE YOUR OWN HIGH FIDELITY RECORDS

33 1/3, 45 or 78 rpm

**LIVE, OFF-THE-AIR
OR FROM YOUR FAVORITE
TAPE RECORDINGS**

WITH THE

REK-O-KUT

Challenger

AND PLAY THEM BACK
ON ANY PHONO SYSTEM

HERE'S NOW...

REK-O-KUT Company Dept. DF-12,
38-01 Queens Boulevard
Long Island City 1, N. Y.

Send me complete details about the
Challenger professional type, portable
Recorder and Playback Phonograph. Also
include literature covering:

- ☐ Rondine 12-inch Turntables
☐ Portable Phonograph Units

Name _____

Address _____

City _____ Zone _____ State _____

My Dealer is _____

NEW TV GRANTS SINCE FREEZE LIFT

Continuing the listing of construction permits granted by FCC since lifting of freeze. Additional stations will be carried next month.

STATE	CITY	CALL	CHANNEL	FREQUENCY	POWER*
Alabama	Mobile	.....	8	76-82	100
Iowa	Des Moines	.....	8	180-186	316
Washington	Yakima	.....	23	524-530	21.9

NEW CALL LETTER ASSIGNMENTS

STATE	CITY	CALL	CHANNEL	FREQUENCY
Idaho	Lewiston	KLEW-TV	3	60-66
Louisiana	Shreveport	KTBB-TV	3	60-66
Missouri	St. Louis	KTVI	36	602-608
Pennsylvania	Sunbury	WKOK-TV	38	614-620

CALL LETTER CHANGES

Ohio	Lima	WIMA-TV (Formerly WKOK-TV)	73	824-830
Virginia	Petersburg	WVAA-TV (Formerly WPRO-TV)	8	180-186

*ERP=(effective radiated power, kw.)

..... Call letters to be announced

day is in operation. It's a 50-foot parabolic reflector built for operation at wavelengths as short as 8 mm.

Describing this huge dish at the recent IRE meeting in New York, D. L. Holzschuh, of *Collins Radio*, said that the antenna is assisting astronomers in their study of radiations from the sun, moon, and hot hydrogen regions of the galaxy.

The reflecting surface of the dish is composed of thirty sections of cast aluminum weighing a total of 30,000 pounds, and is supported by a circular-welded 2S aluminum girder weighing 16,000 pounds. The assembly is pivoted in altitude on roller bearings supported by a welded steel yoke; this

is mounted on a standard hydraulically-driven twin five-inch gun mount that positions the dish in both azimuth and altitude. A steel operating link connects the rear of the gun mount slide with the dish-support ring to vary the altitude between limits of +95 degrees and -12 degrees. In all, the structure aggregates 75 tons.

Fabrication of the dish structure was carried on in a tent, out of doors, at Cedar Rapids, Iowa. Welding was of the inert-gas shield electric type with 2S aluminum wire 3/32 inch in diameter fed continuously into the arc and functioning as the negative electrode. A total of 150 pounds of wire was used with a total of 3000 cubic

The Remington Rand "Univac" in operation. The Central Computer is visible in the background while the Supervisory Control panel, which gives the operator a continuing picture of the operations of the computer, is in the foreground. The control printer, at the right behind the operator, is used for printing out spot results, or to permit the computer and the operator to communicate with each other. The mercury memory, in which all information being processed is stored for instantaneous access, is inside the Central Computer cabinet. At the right are the "Uniservos," high-speed, tape-handling mechanisms that feed information into the computer and take away the finished results. One reel of the "Univac" tape holds 1,500,000 alphabetic or numeric characters. Auxiliary tape equipment is not shown.



RADIO & TELEVISION NEWS

feet mixture of argon and helium. Direct current welding was performed at from 250 to 450 amperes.

The dish was shipped in four gondola cars to Washington. Reassembly was completed in six weeks and another five and a half months were spent in adjusting and checking.

The antenna has recently been used to locate heretofore-unknown radio stars at 10-cm and 3-cm wavelengths, to plot the temperature of the moon across its surface at 8.5-mm wavelength, and to study radiation from hot interstellar hydrogen gas at 21-cm wavelength.

FM's stock took quite a leap in the early Spring when the Commission authorized functional music and related services on both a simplex (for one year only) and multiplex basis.

FM broadcasters will receive a special *subsidiary communications authorization* if, in addition to providing a newly established minimum of 36 hours weekly of program service, they wish to simplex or multiplex functional music, news, time, weather, or related subsidiary program material to certain customers equipped with special receivers.

The FCC ruled that the supplementary program material would have to have a content of either an entertainment or informational nature, but could not compete with services now available through common carrier or

other licensed channels, such as taxi dispatching or doctor paging.

THE FIRST OFFICIAL demixing move that would make a city all-v.h.f. or all-u.h.f. has been taken by the Commission. Notices of rule making were released for cities in Indiana, Connecticut, Wisconsin, and Illinois.

Evansville, Ind., and Peoria, Ill., are two of the cities involved. The Evansville situation is complex, because here the Commission will have to decide the fate of a single low-band station (channel 7) and three u.h.f. channels (50, 56, and 62). A similar situation obtains in Hartford, Conn., where one v.h.f. and two u.h.f. channels must be re-aligned. And in Madison, Wis., channels 3, 21, 27, and 33 have been thrown in the ring for a decision.

Station allocations continued to trickle and, as this column was being written, only those shown in the table on page 110 have the green light.

THE FATHER OF RADIO IN THE NAVY, Rear Admiral Stanford C. Hooper, is dead. Since the early days of World War I, the Admiral had been actually the Navy's top engineering specialist on radio communications. And, in addition, he had served as chief engineer of the Federal Radio Commission. His dynamic contributions to the military and commercial world played a significant role in communications progress. . . . L. W.

COLOR TV EXPERIMENTERS!



Look What You Get for **\$99.50**
the Remarkably Low

Price of Only
(See Dec. '54 Radio & Television News article on Color TV Conversion)

A COMPLETELY OPERATING PHILIPS PROTEGRAM TV SYSTEM

BRAND NEW—
shipped in original factory sealed container
YOU GET A COMPLETE PACKAGE INCLUDING:

• A Chassis completely wired and ready for use, including 33 tubes plus one diode • Protegram projection unit including picture tube • 25,000 volt power supply • 8" dynamic Hi-Fi speaker on large built-in base
• A 25" flat viewing screen and full size reflecting mirror
NOTE: Chassis circuitry includes . . . Automatic beam suppressor . . . High Fidelity sound system . . . Automatic gate control . . . "Standard Out" tuner, etc. \$400.00 original cost of parts, units and accessories to experienced users.

EDUCATIONAL . . . ENTERTAINING . . .
TERMS: F.O.B. N.Y.C. Full remittance with order or 25% balance C.O.D.—10 day money back guarantee.

THE GOLDSTAR COMPANY
50 Walker St., N. Y. 13, N. Y. Phone: WA. 8-1187

Just Out



NEW MANUAL
Be prepared to repair quickly all new 1955 radio sets. In this big, single volume you have easy-to-use, extra large schematics, needed alignment data, replacement parts lists, voltage values, and information on stage gain, location of trimmers, and dial stringing, for almost every 1955 radio. Includes auto radios, portables, changers, and all types of home sets. Giant size, 8 1/2 x 11 1/2". manual style, sturdy binding. Price, only **\$2**

New Supreme 1955 Radio Manual

Now you can benefit and save money with Supreme amazing scoop of 1955. This one giant volume has all the service data you need on all recent radio sets. A full year of models of all popular makes, home and auto sets, portable radios, combinations, changers, all included. The full price for this mammoth 1955 manual is only \$2, nothing else to buy for a whole year. Other Supreme radio service volumes for previous years (mostly at \$2) are described below. Separate TV manuals are listed at right.

SUPREME RADIO MANUALS FOR PREVIOUS YEARS

Use Supreme manuals to repair all radios faster, easier; save time and make more money. Here is your lowest-priced service data. Covers all years, from 1926-38 to 1955 models, in 15 volumes. Used by 168,000 shrewd servicemen. Most volumes only \$2 each, see coupon. Average volume 190 large pages, 8 1/2 x 11 inches. Quality printing, easy to use, manual-style binding. Amazing values. Be wise, use these manuals to get all needed diagrams, parts lists, alignment facts, and service hints, at the smallest cost. Send no-risk coupon.

TELEVISION SERVICING COURSE

Let this new course help you in TV servicing. Amazing bargain complete, only \$3, full price for all lessons. Giant in size, mammoth in scope, topics just like a \$200.00 correspondence course. Lessons on picture faults, circuits, adjustments, short-cuts, UHF, alignment hints, antenna problems, trouble-shooting, test equipment, picture analysis. Special, only **\$3**



Supreme Publications

Sold by All Leading Parts Jobbers

June, 1955

SUPREME TELEVISION SERIES

Here is your complete source of TV service data. These manuals at only \$3, \$5, and \$1.50 each are amazing bargains and defy competition. Each manual covers a whole year of models, using original factory material. Include giant double-spread circuits and blueprints, alignment procedure, voltage charts, test patterns, wave forms, factory revisions, and helpful service hints. Select volumes from list below and send no-risk coupon.



1955 TV Manual.
New, giant volume of TV factory data. Complete, only \$3
1954 TV Manual, \$3
1953 TV Manual, \$3
1952 TV Manual, \$3
1951 TV Manual, \$3
1950 TV Manual, \$3
1949 TV Manual, \$3
1948 TV Manual, \$3
1947 FM & TV, \$2
UHF Manual, \$1.50

NO-RISK TRIAL ORDER COUPON

SUPREME PUBLICATIONS, 1760 Balsam Rd., Highland Park, ILL.

Radio Diagram Manuals

☐ 1955 Radio Manual, \$2
☐ 1954 Radio Manual, \$2.50
☐ 1953 Diagrams
☐ 1952 Radio
☐ 1951 Diagrams
☐ 1950 Manual
☐ 1949 Radio
☐ 1948
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☐ 1946
☐ 1945
☐ 1944
☐ 1943
☐ 1942
☐ 1941
☐ 1940
☐ 1939
☐ 1926-1938 Manual, \$2.50
☐ Radio and TV Master Index, 25¢

ONLY \$2.50 EACH
PRICED AT ONLY \$2 EACH

Rush today Radio manuals checked ☐ at left and TV manuals below. Satisfaction guaranteed.

☐ New 1955 Television Manual, \$3. ☐ 1954 TV, \$3.
☐ 1953 TV Manual, \$3. ☐ UHF Units, \$1.50
☐ 1952 Television Manual, \$3. ☐ 1951 TV, \$3.
☐ 1950 Television Manual, \$3. ☐ 1949 TV, \$3.
☐ 1948 TV, \$3. ☐ 1947 TV & FM, only \$2.
☐ New Television Servicing Course, complete . . . \$3.

☐ I am enclosing \$ Send postpaid.
☐ Send C.O.D. I am enclosing \$ deposit.

Name:

Address:

SURPLUS BARGAINS

MOBILE DYNAMOTORS

Made by PIONEER GEN-E-MOTOR

Compact, efficient dynamotors designed for commercial service. Filter houses attached to bottom of dynamotors contain A and B filters, oil condensers and RF filters. Dynamotors have internal cooling fans. Ideal for taxi, aircraft, marine and amateur services. Fully guaranteed.

5.5 TO 6 VOLT DC INPUT				
OUTPUT	ICAP*	CCB*	FILTER	PRICE
400 VDC	275 ma	175 ma	with	\$19.95
500 VDC	300 ma	200 ma	with	22.95
500 VDC	300 ma	200 ma	less	19.95

11.5 TO 12 VOLT DC INPUT				
OUTPUT	ICAP*	CCB*	FILTER	PRICE
400 VDC	275 ma	175 ma	with	17.95
500 VDC	300 ma	200 ma	with	21.95
500 VDC	300 ma	200 ma	less	18.95
400 VDC	175 ma		less	9.95
210 VDC		40 ma	less	4.95

*ICAP-Inner, Duty

*CCB-Cont. Duty

MOBILE RELAY

6 VDC Coil 60W, 90 amp contact for dynamotor starting plus extra contacts for silencing receiver, SPRT normally closed, made for Struthers-Dunn. Specially priced at **\$89.00**.

WESTON MODEL 506

2" Round, Bakelite Case, Panel Meter, 100-0-100 Microamperes **\$4.95 ea.**

GLOBAL NON-INDUCTIVE RESISTORS

5 ohm 100 Watt..... 6 for \$1.45
 25 ohm 25 Watt..... 5 for .95
 250 ohm 100 Watt..... 5 for 1.95

OIL CONDENSER SPECIALS

Broad New, Ceramic Ins.

1 MFD 2000 VDC..... \$1.85
 5 MFD 1500 VDC..... 1.95
 5 MFD 1000 VDC..... 1.80
 2 MFD 2000 VDC..... 1.50
 10 MFD 600 VDC..... 1.10
 10 MFD 1600 VDC..... 2.50

1" MINIATURE METER

Mounts in a 1" hole like a Pilot light. Basic movement 0-10 mls. Can be shunted in any millamp. range. Manufactured by International Ind. Co.
SPECIAL 0-10 mls..... \$3.95
 0-0.5 mls..... 3.85

PANEL METERS

Gov't Surplus, G.E., Westinghouse, Western Electric, Simpson, Etc.

5" METERS
 0-4 amp AC..... \$3.95
 0-10 amp AC..... 5.95
 0-10 amp DC..... 2.95
 5" METERS
 0-500 milliamperes..... \$5.95
 0-200 milliamperes..... 4.95

WESTINGHOUSE METER SPECIAL

Type NK33, 3" round bakelite case.
 0-500 MA AC..... \$4.75 ea.
 0-500 MA DC..... 4.75 ea.
 (2 FOR \$8.95)

OIL CONDENSERS

4 MFD-600VDC 9.75 3 MFD-2000VDC 92.95
 3 MFD-600VDC .95 3 MFD-2500VDC 3.95
 4 MFD-1000VDC 1.35 5 MFD-7500VDC 1.75
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G. E. RELAY CONTROL

(Ideal for Model Controls, Etc.)

Contains a signal midjet 8,000 ohm, relay (trip at less than 2 MA), high impedance choke, bimetal strip, neon pilot and many useful parts. The sensitive relay alone is worth much more than the total **\$1.25** each **\$9.90** low price of.....

WIRE WOUND RESISTOR KIT, 25 popular assorted—5, 10, 20, 50, 100 watt..... **\$1.95**

READ 'N' SAVE BARGAINS

500 mmf ceramic condensers..... 10 for .30
 15V AC relay (SPST) 15 Amp contacts..... 1.75
 .01 mmf, 1000 VDC Mica..... 5 for .95
 .0004 2500 VDC Mica..... 5 for .95
 .04 600 V Mica..... 5 for .95
 100,000 ohm, 100 Watt resist..... .95

Min. Order \$3.00—25% with Order—F.O.B. New York.

PEAK ELECTRONICS CO.

66 West Broadway, New York 7, N. Y.
 Phone WO 2-5439

The NARTB Curve

(Continued from page 41)

sponse will be obtained from the playback head and its amplifier. However, the NARTB standard calls for this compensation to be as shown in Fig. 6. Suppose we work backward and see what this means in terms of the signal on the tape. The 6 db curve would result in flat response. Application of the NARTB standard gives the curve in Fig. 7.

It will be seen that this curve agrees with the general approach discussed in the first part of this article. Thus, we have a standard based on the signal level recorded on a tape and expressed in terms of a calibrated playback system. The standard is based on the characteristics of tapes in general; and on the characteristics of program material. Also, the standard is expressed in terms of a 15 inch-per-second tape speed. However, there is nothing in the basic philosophy of the standard that is a function of the speed unless it is the overload characteristic of the tape. (Note that the calibrated head gap loss correction is a function of tape speed, but is outside the basic standard.) The standard also allows complete freedom to the recordist in choosing the type of bias, or amount of a.c. bias, or any other characteristic at the recording end of the system, as long as he is satisfied with the results he obtains in playing it back through the standard playback system.

There has been very little material published on the overload characteristics of tapes. It would be most useful to have definite data on this point, including the effect of different tape speeds, before future standards are set. It is quite possible that still more pre-emphasis could be safely used. The graphs in Figs. 1, 2, and 4 were purposely presented without db scales because exact data was lacking.

It should probably be added in closing that the standard established was the result of compromise between several companies engaged in producing professional recording equipment, and is more or less an average of the various values used by them before the standard was established. In the author's opinion it was a sound choice for professional recording. There may have been members who disagreed in principle, but who agreed in fact in order to attain a standard. It was most gratifying to the committee members to find their standards so quickly adopted by the industry.

It is to be hoped that the adoption of uniform standards for home-type recorders will be handled as expeditiously as the professional standards.

REFERENCES

1. Olson, H. F.: "Musical Engineering," McGraw-Hill Book Company, Chapters 6 and 9.
2. "Bell Laboratories Record," June 1934.

No Motors! No Electricity!

ROTATES ELECTRONICALLY

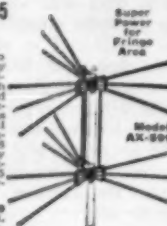
340 Reception VHF Channels 2-13

Exclusive Snyder "Directonic" \$16.95

Design

No roof orientation, no ground—its electronically biased by Directonic 6-position selector. Swivel on or near TV set. "Around the compass," 360° electronic rotation gives bright, sharp pic on all channels. Complete, double stacked array with 18 hi-tensile double alloy aluminum elements. Includes Selector Sw. 75 ft. 3 cond. cable. Guaranteed.

TX-500 same as AX-500 but includes 3 3 1/2 ft. mounts, guy ring & masts. Terrific buy \$18.95



MORE Special Values on

SNYDER Brand Band Yagis, for fringe or ultra fringe. Complete with U-clamps, RB-2-6 for 2 1/2 thru 6..... \$9.95
 RB-13 for 13 thru 13..... \$4.95
LEAD-IN, 300 ohm 30 ft. twin lead..... \$20.55
 100 ft. 25¢ per ft. \$25.55 per 100 ft.
UNIVERSAL, 31 1/2" Wood Screw-in, Stand Off Insulators only 34 each
LIGHTNING Arrestor Ray UL approved, 1/4" 1..... 39¢ ea.
SWIVEL Mount base for 1 1/2" OD Mast..... 39¢ ea.
 2 1/2" Alum. Grad. Wire, 100 ft..... \$1.95

STRAP type 3 1/2" Stand Off Insulators for masts up to 2 1/2 inches..... 9¢ ea.
SNAP-ON type 3 1/2" Stand Off Insulators for 1 1/2" OD Masts..... 6¢ ea.
CHIMNEY Mount Bracket C36-100..... \$1.95
GUY WIRE, 50 ft. coil, 6 stranded 20, 30¢
WALL MOUNTS
 6", for masts 1-1 1/2 inches..... \$3.00 \$1.15
 12", for masts 1-1 1/2 inches..... \$3.12 \$1.05
 Special 18", for masts up to 1 1/2", WB-3..... \$2.95
 2 1/2" Alum. Grad. Wire, 100 ft..... \$1.95

SYLVANIA 5AXP4 5" Universal

Handiest, safest, fastest all purpose test tube. Check performance of any TV set. any size, make or model. 5" dia. **\$22.00**

Write for FREE FYI Bulletin 224

WHOLESALE RADIO PARTS CO., Inc.

311 W. Baltimore St. Baltimore 1, Md.



The NAUTILUS

WITH NEW "TEAR DROP" MOUNTING BASE

The Radeco Nautilus provides the first basic change in antenna design in a decade... and its beauty will endure as long as automobiles retain their present streamlined design of flowing movement.

Available in two models for either front or rear mounting. Model NT-3 is for front installation with a 4 ft. lead-in cable. Model NT3-15 is for rear installation with a 15 ft. lead-in cable and 75 MMF Ceramic Condenser.

Model	Sec.	Lead Lth.	List
NT-3	3	4 ft.	\$6.15
NT3-15	3	15 ft.	8.65



RADECO MANUFACTURING CO.

CLEVELAND 25, OHIO

RADIO & TELEVISION NEWS

(Continued from page 54)

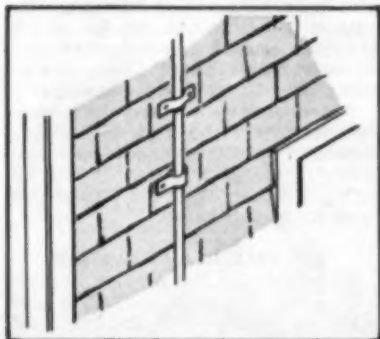
The second method of tuning the output of the amplifier is shown in Fig. 2. This method is similar to the sweep generator method except that the signal generator or v.f.o. is manually swept over the band and the results noted on the meter. The meter readings *versus* frequency is plotted mentally or on graph paper if desired. In this way the effect of a tap change, etc. can be observed. This point-by-point method, while slower, is just as good as the sweep generator method. Make the adjustments with a 300-ohm load resistor as before. When a flat response is obtained substitute the antenna and touch up the tuning of C_{12} and C_{15} as may be required. The meter and detector can be removed. The tuning procedure is now complete and the amplifier ready for use.

By HYMAN HERMAN

IN TV INSTALLATIONS where the lead-in line is to run down along asbestos or wood shingling, I use small strips of plastic, about two inches long, to fasten the wire to the side of the building. These plastic strips are made from ordinary twinlead with the copper conductors removed. The strip is placed across the twin-lead, holding it against the side of the building, and either copper or aluminum nails are used to tack the strip down. These nails prevent streaks. By using small hard steel cut nails, these plastic strips may be used on brick or concrete.

-36-

Plastic strips made from twinlead hold TV downlead against asbestos shingling.



June, 1955

**Centralab Pocket-Edition
Control Guide No. 1**

**Here's the quickest way yet
to find the right
control replacement!**



Lists Centralab replacements by manufacturers' part numbers — for TV, radio, audio, auto radio.

Handy size, 3 $\frac{3}{4}$ " x 8 $\frac{1}{4}$ ".

Always up to date — completely revised and printed quarterly.

Get a copy of Centralab Pocket-Edition Control Guide No. 1 for yourself and each of your men. Ask your Centralab distributor — or order direct by coupon below.

Centralab

☐ Enclosed is \$1.00 for the next five editions of the pocket control guide.

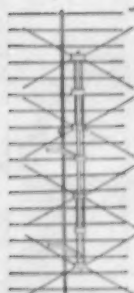
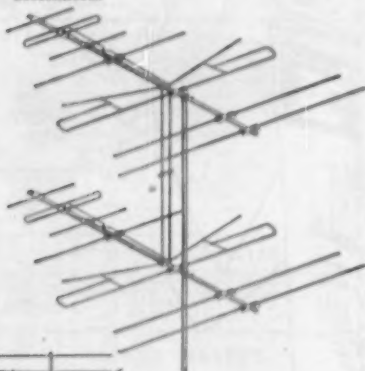
☐ Enclosed is 20 cents for the current edition *only*. (Paste coins securely to cardboard.)

Name _____
Company _____
Address _____
City _____ Zone _____ State _____

**PRICED AMAZINGLY LOW
FOR BIGGER MARK-UP
... FASTER TURNOVER**

Sky-Ray ANTENNAS

offer you more profits! How? By giving quality equal to or better than other TV antennas plus amazingly low prices that provide bigger mark-up or faster turnover. This combination of quality and price is achieved by excellent engineering coupled with cost-conscious construction. Standard weight materials are used throughout and none are wasted. Clean, functional design contributes a pleasing appearance but eliminates expensive "gingerbread". The results are all-aluminum antennas ... lightweight and rugged ... that sell fast. And all Sky-Ray Antennas are pre-assembled.



Model ACV-2 "SUPER-RAY", All-Channel VHF Antenna ... Sky-Ray's new twin-bay model featuring improved front-to-back ratio and higher gain. Has Snap-In construction, reinforced at the U-bolt connection. Matches 300-ohm transmission line. Suggested list price ... \$24.50.

Model UCP All-Channel UHF Array. Highest gain and front-to-back ratio on UHF. Completely pre-assembled; only 4 wing nuts to tighten. Suggested list price ... \$10.85.

SNAP-IN CONSTRUCTION. One push and elements are locked securely in position. No bolts to tighten. This feature on all Sky-Ray VHF Antennas gives the easiest, fastest installation possible.



Sky-Ray offers complete lines of proven, top-quality, low-priced antennas for all TV bands; for VHF ... Snap-In Yagis, Conicals, and In-Lines; for UHF ... Bow Ties, and Single and Double Corner Reflector types. Get these big-profit antennas now. Ask your jobber for specifications and price lists or write direct to ...

SKY-RAY MANUFACTURING CO.

MCLEANSBORO, ILLINOIS



WALSCO SALES FILM

A new motion picture produced for WalSCO Electronics Corporation, 3225 Exposition Place, Los Angeles 18, California, is now being released for showing to a nation-wide audience of the jobber and dealer salesmen who handle the company's line of TV antennas.

Photographed in color, this fifteen minute film, entitled "Something to Talk About", is specifically designed to supply complete selling information on the firm's antenna production and testing techniques.

Present plans include showings of the movie at special sales meetings held at a local level. For information on the availability of the film for local showings, write the company direct.

E-V PROMOTION MATERIAL

Dramatic and colorful metal merchandisers designed to stock, display, and sell phonograph cartridges in the company's new sealed-in-plastic "Blister-Paks" have been introduced by Electro-Voice, Inc. of Buchanan, Michigan.

The new compact, three-color, two-drawer SA-3 merchandiser for the service dealer can be placed on a counter or shelf, or hung anywhere for attention-getting display.

For quick and easy product identification, the front of each drawer represents the "Blister-Pak" package. The new package permits easier servicing because of the full model identifica-



tion, interchangeability chart, and instructions printed on each package.

MANUAL DISPLAY RACK

Supreme Publications, 1760 Balsam Road, Highland Park, Illinois, is currently distributing a newly-designed display stand to all of its active jobbers.

The new stand will aid in calling attention to the firm's line of radio and

television manuals in addition to holding a basic stock. The company is planning other steps to aid jobbers in increasing the demand for its publications.

CHANNEL MASTER ITEMS

Channel Master Corp., Ellenville, New York, has launched a packaging and promotion program based on the theme that "1955 is Channel Master's Banner Year".

To spark the promotion and dramatize the "Banner Year" theme, specially-designed satin banners are being made available for display by dealers. The banners feature gold lettering on deep blue satin with gold tassels, hanging cord, and cross-bar. They are suitable for wall or window display.

The package program applies to the



company's entire line of TV accessories. The purpose is to provide all accessories with uniform and distinctive cartons, in step with the latest trends in modern packaging.

Almost identical layout designs are employed on all cartons, uniformly printed with maroon lettering over a blue grid. Though of different shapes and sizes, they are easily identifiable as the company's containers.

WINDOW DISPLAY CONTEST

Retail dealers and distributor salesmen of RCA Victor portable radios will be eligible to share \$10,000 in prizes which will be awarded in a nation-wide window display contest.

Dealers in each of the company's eight regions will be eligible for prizes totaling \$1000 while distributor salesmen servicing them can win up to \$250 in each region. The awards will be made for the best windows built around the theme, "Take A Song Along—with an RCA Victor Portable". The contest will be in two categories with identical awards for "Most Original Window Display" and "Best Window Using RCA Victor Display Material".

The contest is on now and closes July 9th. To be eligible, a display must remain in a dealer's window for a minimum period of two weeks. For full information on this contest, contact local RCA distributors.

CBS-COLUMBIA PROMOTION

CBS-Columbia has planned an elaborate and extensive promotion program to merchandise its new "Advanced 1600" television receiver.

An all-out advertising-merchandising program has been set up and will include TV programming support, point-of-purchase material advertising support, etc. The point-of-purchase material includes brightly colored store window streamers, set-top signs, "blue tag" cards, postcard mats for local mailings, reprints of trade and consumer ads, complete salesman's instruction sheets, reply cards, etc.

The whole program is tied in with Arthur Godfrey's programs as well as three other company-sponsored programs. This "Blue Tag Special" promotion is currently being introduced throughout the country via closed-circuit telecasts to dealers.

RETMA'S HAM COURSE

IN ORDER to stimulate still further interest in amateur radio, RETMA has prepared and is distributing a complete amateur radio course that has been custom-designed for the beginner. It is based on material prepared by educators, experienced hams, and engineers.

The course consists of code records, theory and license manuals which will be made available from RETMA headquarters, 777 14th Street, N. W., Washington 5, D. C., for \$10.00 complete.

A copy of the booklet "Gateway to a Career," describing the ham hobby, is available free.

CERTIFICATES OF MERIT

OVER 1200 licensed radio amateurs have been awarded certificates of merit for emergency service during the 1954 hurricanes by the judges of the annual Edison Radio Amateur Award.

The judges cited amateur operators in 28 of the 48 states, mostly in the eastern coastal regions, but also a few in Nevada, Michigan, California, Wisconsin, and Washington as well as the District of Columbia. Operators in Alaska and Puerto Rico were also cited as were many in Canada, especially the Province of Ontario. The certificates have been mailed out by General Electric Company's tube department, sponsors of the Edison Radio Amateur Award.

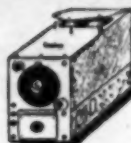
In granting the hurricane citations, the judges commended the amateurs for one of their most outstanding public services of continuing communications in areas where the "Three Sisters" caused untold destruction. They also pointed out that an unparalleled number of amateur radio operators joined in setting up emergency radio networks which were used for fire, police, and civil defense protection during hurricanes "Carol," "Edna," and "Hazel." The judges based their action on field reports compiled by the American Radio Relay League.

Commendation also was extended to "Many radio amateurs who spent long hours standing by to help if needed—but whose hurricane vigils unfortunately are unrecorded."

These special certificates of merit were in addition to the regular annual awards which are made to amateurs who have rendered exceptional public service to their communities and the nation as a whole through the medium of amateur radio communications.

SAVE!...BARGAINS GALORE!...SAVE!

COMMAND — TRANSMITTERS — RECEIVERS



FAMOUS "Q" 5's
190-550 KC W/TUBES

XLNT COND. **\$10⁹⁵**

BC-455 Receiver 6-9 MC—with tubes for 40 Meters. Brand New.....\$5.95
Excellent.....4.95
Used. As is, less tubes.....1.95
BC-454 Receiver 3-6 MC—with tubes for 75 & 80 Meters. Brand New.....\$9.95
Excellent.....7.95
Used. As is, less tubes.....2.95
R-25 ARC Marine Band Receiver 1.5 to 3 MC. Brand New with tubes 28 V Dyn.....\$14.95
14 V Dynamotor above receiver—used XLNT.....4.95
BC-696 Xmitr 3-4 MC. As is with tubes.....\$6.95
BC-457 Xmitr 4-5.3 MC. Xint with tubes.....4.95
Sold as is, less tubes.....2.95
BC-458 Xmitr 5.3-7 MC. Xint with tubes.....4.95
Sold as is, less tubes.....2.95
BC-459 Xmitr 7-9.1 MC. Xint with tubes.....9.95
Sold as is, less tubes.....4.95
BC-456 Modulator. Xint with tubes.....3.95
MD-7 Modulator—Push-Pull 1625, will modulate 50 W of carrier. Xint with tubes.....7.95
BC-450 3 Receiver Control Box. Xint.....1.49
BC-451 Transmitter Control Box. Xint.....1.49
3 Receiver Back. Xint.....1.49
3 Transmitter Back. Xint.....1.49
Full XFMR for above equip. 110 PkV, sec. 24 V CT @ 1 Amp, New.....2.49

SAM'S COMB. SPECIAL!

40 Meter Group

1-BC-455 Xmitr.—5.3-7 Mc. Xint. Cond. with Tubes.....\$4.95
1-BC-456 Modulator, Xint. Cond. with Tubes.....\$3.95
1-BC-455—6-9 Mc. Recv., Xint. Cond. with Tubes.....\$4.95
Special—Complete Group.....\$11.95

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1-BC-456 Modulator, Xint. Cond. with Tubes.....\$3.95
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Just plug it into the rear of your 274-N RECEIVER... any model. Complete kit and black metal case, with ALL parts and diagrams. Simple and easy to build in a jiffy. Delivers 24 volts plus B voltage. No wiring changes to be made. Designed especially for the 274-N receiver. Only \$8.95. Assem.....\$12.95

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All New. All D.C. 2" Square.

0-2 Ma.....\$3.29 each
0-5 Ma.....
0-15 Ma.....
0-50 Ma.....
0-100 Ma.....
0-200 Ma.....
0-300 Ma.....
0-500 Ma.....
OR
3 for \$9.00



DC VOLT METERS—2" SQ.

0-20 V. DC.....\$3.29 each
0-40 V. DC.....
0-300 V. DC.....3 for \$9.00

BC-375 Mod. XFMR. Matches pair of 6146's, 815, 807, 1625. New...\$2.95

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2 MFD—E. 5000 V. New.....3.95
2 MFD—Aerovox, 2500 V. New.....3.49
10 MFD—Fest. 600 V. New.....1.49
2 MFD—Aerovox or Solar, 600 V. New......89
4 MFD—GE, 600 V. DC. New......87



ARR-2 RECEIVER

234-250 MC. TUNABLE
11 Tube Superhet.
Easily converts to 2 meters.
Like New.....\$7.95
Control Box.....\$1.50

PLATE TRANSFORMER

American Trans. Co. Input: 115 V.A.C. 60 Cycle. Sec. 2240 V.A.C. CT @ 500 Ma.
BRAND NEW.....\$14.95

Shipping Wt. 55 lbs.

AMATRAN-VARIAC



100 AMP
ONLY **\$139⁰⁰**

110 VAC-60 Cy. Input. Output 0 to 110 VAC max. load 100 Amp.

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6 & 12 Volt Dynamotor Specials



PE-101C DYNAMOTOR

This is the Dynamotor the hams have been talking about! Easily adapted to supply on 12 V. input 500 V. DC. @ 200 Ma. and also 235 V. DC. @ 125 Ma. Brand New.....\$6.95
Elector Dynamotor—11.6 V. DC. input. Output 425 V. DC. @ 375 Ma. Brand New.....\$9.95
Wincharger Dynamotor—12 V. input. output 440 V. DC. @ 220 Ma. Brand New.....\$14.95
BD-77 Dynamotor—12 V. input. Output 1000 V. DC. @ 350 Ma. Brand New.....\$14.95
BD-69 Dynamotor—Made by Elicor—14 V. input @ 2.5 A. Output 220 V. DC. @ 80 Ma. Brand New.....\$9.95
PE-73 Dynamotor—24 V. input. Output 1000 V. DC. @ 350 Ma. Brand New.....\$8.95
Used.....\$6.95

GP-7 TRANSMITTER

100-watt master oscillator type. Can be used on any frequency from 520 to 9950 KC by using the proper plug-in tuning unit. Type 883 PA and built-in 400 cycle power supply using a pair of 1616 rectifiers. Three 2-inch panel meters: 6-300 MA DC, 6-3 RF Amps, 0-15 AC Volts. A grid mixer of excellent quality—components for building and saving any high wattage rig. Comes complete with one tuning unit and tubes.
Excellent condition.....\$13.95

ARB NAVY RECEIVER

160 to 9950 KC. Four Bands. Calibrated Dial. LP Ship-RC—80 & 40 Meter—Complete with Tubes and Dynamotor. For 24 Volt operation; easily converted to 110 V.—12 or 6 Volt. Size 8 1/2" x 7 1/4" x 15 1/4". Like New. With schematic. Weight 30 lbs.....\$14.95

Broadcast Band and Aero MN-26C Installation

A 12 tube remote control manual direction finder desirable for commercial type navigation on land and planes. Has a frequency range of 150 kc to 1500 kc in 3 bands. This frequency covers the lowest and standard broadcast bands. Operation on 28 V. DC input. Complete installation consists of:
MN-26C Receiver Brand New \$54.95
MN-26C Rotatable Lens New 4.95
MN-50 Azimuth Control New 2.95



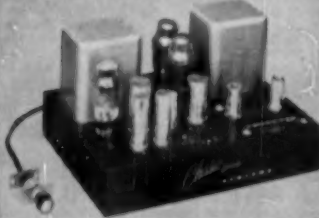
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Perfection*



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Here is the product of perfectionists, for the perfectionist in hi-fi. Designed as a laboratory standard by one of America's foremost amplifier specialists since 1937. Remote control unit less than four inches high and deep, only nine inches wide, can be placed up to 100 feet from equipment center. Response inherently excellent to 100,000 cycles... distortion less than $\frac{1}{100}\%$ up to 10 watts... less than $\frac{3}{10}\%$ at 20 watts... full 25 watt output... "Audi-Balance" distortion control gives you lifetime freedom from distortion, and only Newcomb has it... 6-position bass crossover and treble rolloff controls give 36 recording curves. Write for complete details.



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"Hi-Fi Is For Everybody" explains how to select and install your system. Thoroughly illustrated. Not a catalog.



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"TV REPAIR QUESTIONS AND ANSWERS—FRONT ENDS" by Sidney Platt. Published by John F. Rider Publisher, Inc., New York. 120 pages. Price \$2.10, paper bound.

Although this is a service manual "with a difference", the material presented is every bit as usable as that provided in the average text.

Presented in question-and-answer form is much valuable information for the practicing TV technician and the student of television work. Techniques and procedures are given precedence over theory in the belief that hard-hitting facts are what most service technicians are seeking.

This particular volume covers the servicing aspects of antennas, transmission lines, and front ends. In order to locate the answers to specific problems which arise, the book is divided into chapters which are based on the signal flow path in the receiver installation.

Although specific servicing problems are taken up in the text, the information supplied in the "answer" portions can be used as a guide to troubleshooting and repairing the receivers of many manufacturers.

The section on front ends is divided into three chapters dealing with mechanical, electrical, and alignment techniques. Antennas, transmission lines, and boosters and u.h.f. converters each rate a separate chapter.

The technique of providing a "discussion" in addition to the "answer" for each of the problems definitely adds to the value of this manual as it applies the "why's" for those interested in delving a little deeper into the problem.

"SERVOMECHANISMS AND REGULATING SYSTEM DESIGN" by Harold Chestnut & Robert W. Mayer. Published by John Wiley & Sons, Inc., New York. 375 pages. Price \$8.50.

In this, Volume 2, the authors have presented the practical application behind the "theory" presented in their first volume.

Unlike the first volume, which was designed especially for the student and the engineer encountering servomechanisms for the first time, this book is for the practicing designer and the advanced graduate student. Because of this shift in audience, the subject matter has been treated differently and in a more rigorous fashion. The first chapter on measurements is both introductory and in the nature of a review of the material of Volume 1. The other chapters deal with such subjects as the influence of input characteristics on control system design; the ac-

tion of controlled system power element with proper rating; networks for obtaining desired attenuation-frequency characteristics; all-a.c. servomechanism operation; amplifier design; linearization of non-linear elements for small departures and large departures; and the application of non-linear elements to control systems.

Unless the student has a fair working knowledge of servomechanisms and a confident ability with things mathematical, it is recommended that the first volume of this series be obtained first and mastered thoroughly.

"RADAR POCKET BOOK" by R.S.H. Boulding. Published by D. Van Nostrand Co., Inc., New York. 173 pages. Price \$3.50.

This compact, concise handbook provides information on the basic electrical principles and formulas applicable to radar. Although the material is considerably compressed, the author has managed to provide an amazing amount of pertinent data in a relatively few pages.

All essential details have been covered including the most modern developments such as the use of crystal rectifiers and transistors. The text material is profusely illustrated by means of typical circuit diagrams of the different units comprising modern radar equipment.

As a concise textbook or a ready-reference for on-the-spot handling of maintenance, this book would be hard to beat. An electrical background is pre-requisite.

"BASIC VACUUM TUBES AND THEIR USES" by John F. Rider & Henry Jacobowitz. Published by John F. Rider Publisher, Inc., New York. 203 pages. Price \$4.50, cloth bound, and \$3.00, paper bound.

Why nobody ever thought of writing a really elementary handbook on vacuum tubes before is hard to understand for certainly such a text was overdue. There are literally thousands of laymen and beginning "electronics men" who are interested in the subject but not qualified to handle the subject at an engineering level. This book is for them.

In keeping with the level of the presentation, the authors' style is informal and easy-to-grasp. Complicated mathematics have been dispensed with in favor of "word formulas".

The book itself is divided into five chapters which include a general introduction to the subject and the historical background, electrons and electron emission, diodes, triodes, and multi-electrode tubes. Photographs, line drawings, and clever cartoon-type explanatory material all contribute.

If you have a tyro "electronic technician" in your home, know an intelligent layman who wants authentic but readable information on a subject which influences his life, or have been looking for a thoroughly enjoyable explanation of vacuum tube operation for yourself, this is your book! -50-

RADIO & TELEVISION NEWS

WASHINGTON HIGH TO GET NEW WING

Doctors Plan Hospital For Convalescents

Night Club Zoning OK'd by Civic Body

PLANS AFOOT FOR NEW CONVENTION HALL

FAIR GROUND OFFICIALS TALK MODERNIZATION PLAN

Bus Terminal Will Move To New Location

They're all Hot Prospects for RCA Sound Systems!

With the exception of residences, there are few building projects these days where sound amplification hasn't an important place. It's profitable business, too, if you recommend and install equipment that's *right the first time!*

Rely on your RCA Distributor

Whatever the size or purpose of the installation, your RCA Distributor has the experience, the inventory to help you expedite the kind of job that will lead to others . . . see him first.

 <p>CUSTOM-BUILT EQUIPMENT</p> <ul style="list-style-type: none"> • Consoles • Desks • Turrets • Cabinets 	 <p>INTERCOMS</p> <ul style="list-style-type: none"> • All Master Systems • Combination Systems • Master-Remote Systems
 <p>SPEAKERS</p> <ul style="list-style-type: none"> • Cone Type • Wall Type • High Fidelity • Console Cabinets 	 <p>MICROPHONES</p> <ul style="list-style-type: none"> • All types • Stands, plugs, cables and connectors

SOUND PRODUCTS
RCA RADIO CORPORATION
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 ENGINEERING PRODUCTS DIVISION · CAMDEN, N.J.
 In Canada: RCA VICTOR Company Limited, Montreal

June, 1955

BUILD 15 RADIO
CIRCUITS AT HOME ONLY
 With the New Improved 1955 Progressive Radio "EDU-KIT" **\$19.95**
 Now Includes Receiver, Transmitter, Code Oscillator, Signal Tracer Circuits

Complete

WHAT THE PROGRESSIVE RADIO "EDU-KIT" OFFERS YOU

Our Kit is designed to provide a fundamental background in radio, with the basic facts of Radio Theory and Construction Practice expressed simply and clearly. You will gain a knowledge of basic Radio Principles involved in Radio Reception, Radio Transmission and Audio Amplification.

You will learn how to identify Radio Symbols and Diagrams; how to build radio circuits, using regular radio circuit schematics; how to mount various radio parts; how to wire and solder in a professional manner. You will learn proper chassis layout. You will learn how to service and troubleshoot radio. You will learn code. You will receive training for P.C.C. Novice License. You will learn High Fidelity.

In brief, you will receive a practical basic education in Radio, worth many times the small price you pay.

THE KIT FOR EVERYONE

The Progressive Radio "Edu-Kit" was specifically prepared for any person who has a desire to learn Radio. The Kit has been used successfully by young and old in all parts of the world. It is not necessary that you have even the slightest background in science or radio.

The Progressive Radio "Edu-Kit" is used by many Radio Schools and Clubs in this country and abroad. It is used by Armed Forces Personnel and Veterans throughout the world.

The Progressive Radio "Edu-Kit" requires no instructor. All instructions are included. All parts are individually boxed, and identified by name, illustration and diagram. Every step involved in building these sets is carefully explained.

PROGRESSIVE TEACHING METHOD

The Progressive Radio "Edu-Kit" comes complete with instructions. These instructions are arranged in a clear, simple and progressive manner. The theory of Radio Transmission, Radio Reception, Audio Amplification and servicing by Signal Tracing is clearly explained. Every part is identified by illustration and diagram. You will learn the function and theory of every part used.

The Progressive Radio "Edu-Kit" uses the principle of "Learn by Doing." Therefore you will build radio circuits, perform jobs, and conduct experiments to illustrate the principle which you learn.

These circuits are designed in a modern manner, according to the best principles of present-day educational practice. You begin by building a simple radio. The next set that you build is slightly more advanced. Gradually, in a progressive manner, you will find yourself constructing still more advanced multi-tube radio circuits, and doing work like a professional Radio Technician. You will build Receiver, Transmitter, Code Oscillator and Signal Tracer Circuits—19 in all. These sets operate on 105-135 V. AC/DC. For use in Foreign Countries having 230-250 Volt Source, an Adapter for 230-250 V. AC/DC operation is available.

THE PROGRESSIVE RADIO "EDU-KIT" IS COMPLETE

You will receive every part necessary to build 19 different radio circuits. The "Edu-Kit" contains tubes, tube sockets, variable electrolytic and paper condensers, resistors, tin strips, coils, hardware, tubing, instruction Manuals, etc. No wire or solder included.

Every part that you need is included. These parts are individually packaged, so that you can easily identify every item. A soldering iron is included, as well as an Electrical and Radio Tester, step-by-step instructions are provided. All parts are guaranteed, brand new, carefully selected and matched.

In addition, the "Edu-Kit" now contains lessons for servicing with the Progressive Signal Tracer, P.C.C. instructions, quizzes, High Fidelity instructions.

TROUBLE-SHOOTING LESSONS

Trouble-shooting and servicing are included. You will learn how to recognize and repair troubles. You will build and learn to operate a professional Signal Tracer. You receive an Electrical and Radio Tester, and learn to use it for radio repairs. While you are learning in this practical way, you will be able to do many a repair job for your neighbors and friends, and charge fees which will far exceed the small cost of the "Edu-Kit." Here is your opportunity to learn radio quickly and easily, and have others pay for it.

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• ELECTRICAL & RADIO TESTER • ELECTRIC SOLDERING IRON • TV BOOK • QUIZZES • FREE CONSULTATION SERVICE • HI-FI GUIDE

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 210-280 V. Foreign Line Voltage Adapter for "Edu-Kit"—\$2.50.
☐ Send "Edu-Kit" C.O.D. I will pay \$19.95 plus postage (U.S.A. only).
☐ I wish additional information describing "Edu-Kit". No Obligation.
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Most outstanding development in pickup history, with models for practically every changer and arm in use. Full frequency range, high compliance, low I.M. distortion, true tracking, low stylus pressure, need no preamplification.

Model TO-284P (Illustrated) — Turnover, with 2 non-interacting sapphire... \$7.50 net

Diamonds available at extra cost.
Other Models from \$5.40 net.

Ronette FONOFUID PICKUP ARM

Equipped with and acoustically matched to the Ronette cartridge. For manually operated turntables. Perfect tracking at high velocities and low stylus pressure; high stability; virtually tension-free; double ballbearing swivel.

For 12" Turntables... \$13.65 net
For 16" Turntables... \$16.50 net

Diamonds available at extra cost.

Ronette MICROPHONES

A quality line of semi-directional crystal microphones for tape recording, professional studio use, and all communications applications. Attractively styled, standard cable connectors; 60 ohm standard microphone stands.

Model G-2105 (Illustrated), for studio use... \$18.00 net

Other models from \$6.30 net.

Ronette CRYSTAL TWEETER

Adds brilliant, shimmering, upper and middle frequency range to your phonograph or radio. Inexpensively and easily wired into your circuit.

Model ZA-1 1/4" diam. x 1/2" thick... \$7.50 net

All Ronette piezo-electric products are guaranteed against humidity and temperature variation.

Write for name of Ronette dealer nearest you.



RONETTE ACOUSTICAL CORPORATION
135 Front St., New York 5, N. Y.

Within the Industry (Continued from page 26)

Washington, D. C. . . . **ESSEX WIRE CORPORATION** has acquired all of the physical assets of **J. M. WHITE, INC.** of Philadelphia, pioneer electrical wire assembly manufacturer. The new subsidiary will be operated as a division of the parent firm . . . The acquisition of **THE LUTHER MFG. CO.** of Olean, N. Y. by **AEROVOX CORPORATION** of New Bedford, Mass. has been announced. The new acquisition will permit the parent company to enlarge its facilities for developing and building automatic production equipment for its various plants . . . **REON RESISTOR CORP.** of Yonkers, N. Y. has purchased the total assets of **COLUMBIA RESISTORS, INC.** of Pearl River, N. Y. All operations have been transferred to the Yonkers plant.

ROY H. OLSON has been appointed director of engineering in the Communications Division of **Motorola, Inc.** In this capacity he will direct the technical activity of the division's industrial products department.



He has been associated with the company since 1951 when he joined the firm's **Phoenix Research Laboratory** as an engineering section leader. He received his degree in electrical engineering from Iowa State in 1934 and immediately thereafter began a 13-year association with **Collins Radio Company**. He subsequently operated his own manufacturing and consulting firm before joining **Motorola**.

A. R. ANDREWS has been appointed to the post of vice-president and general sales manager of the **Pyramid Electric Company**, North Bergen, New Jersey manufacturer of capacitors and selenium rectifiers. He has been a sales representative for the firm since its founding.



Mr. Andrews formerly headed his own representative firm in Syracuse, N. Y., and is a former treasurer of the Empire State chapter of "The Representatives."

He is a graduate of Bucknell and makes his home in Tenaflly, N. J.

EMERSON RADIO AND PHONOGRAPH CORPORATION has moved its administrative headquarters and plant from the Port Authority Building, 111 Eighth Ave., New York City to Jersey City, New Jersey. The firm's public relations and export departments will remain in New York City, occupying a suite in the Plaza Hotel, Fifth Ave. at 59th . . . **AMPLITEL, INCORPORATED**,

Always Buy Columbia

NOVICES! BIG TOOL GIVE AWAY!
TECHNICIANS! Pr. Brand New Diagonal Cutters
AMATEURS! Pr. Brand New Needle Nose Pliers
HOBBYISTS! Brand New Adjustable Wrench
HAMS & MECHANICS! Brand New Set of 10 Screw Drivers with Wall Bracket

PLUS 100 BRAND NEW ELECTRONIC COMPONENTS! ALL FOR... \$5.00

TECHNICIANS! This is for you!
NAVY WALKIE-TALKIE TRY TRANSCEIVER
28-30 MC. Here is a terrific portable deal for the new 6 meter band. Complete with all tubes and new vibrator battery power supply.
A STEAL at ONLY... **\$29.95**

115-V. 60 CYCLES TRY POWER SUPPLY NEW... \$19.95
With 4 V. 40 AH Wet Cell battery and spare parts. Complete. New in original box... **\$8.95**

ANTENNA: Citizens' band and 420 MC. 2 81278 to the package. Overcoats packed. Brand new. 95c
Per Package

SURPRISE! 50 pound package of new, packaged electronic items—tube sockets, resistors, transformers and much. All usable! \$3.50
SURPRISE! All brand new! This is a must!

REACTOR CHOKES SPECIALS			
800 Hf @ 2 MA. Ea.	49¢ 2 for		\$1.25
6 Hf @ 150 MA. Ea.	\$1.49 2 for		2.75
15 Hf @ 150 MA. Ea.	1.95 2 for		3.75
15 Hf @ 200 MA. Ea.	3.95 2 for		7.50
20 Hf @ 225 MA. Ea.	4.95 2 for		9.90

FILAMENT TRANSFORMERS			
All brand new! 115 V. 60 cy. input			
Volt @ Amps	Ea.	2 for	Volt @ Amps
2.5 5	95¢	\$1.75	5.5 10
2.5 10(10KV)	4.95	9.90	5-5.25 12
2.5 10	2.95	5.90	6.3 6
			1.95 3.75

POWER TRANSFORMERS:			
New! 115 V. 60 cy. input			
4700 VCT @ 250 MA. Ea.	\$24.50	2 for	\$47.50
750 VCT @ 250 MA; 6.3 VCT @ 5 A; 5 V. @ 4 A.	Ea.	\$4.95	2 for \$9.90
600 VCT @ 75 MA; 6.3 VCT @ 2.5 A; 5 V. @ 2 A.	Ea.	\$2.95	2 for \$5.90
540 VCT @ 65 MA; 6.3 VCT @ 2 A; 5 V. @ 2 A.	Ea.	\$2.49	2 for \$4.75

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ENJOY 3 COLOR TELEVISION FILTER SCREEN NOW

Changes dull eye-straining black and white pictures into beautiful color tones. Seconds to attach. No tape used. Helps eliminate glare. Order direct. Send \$1 for screen size up to 16". \$1.25 also 17". \$1.50 size 20". \$2 size 25". \$3.50 size 34". \$3 size 27". We pay postage except on C.O.D. orders. Satisfaction guaranteed. Inquiries from dealers also welcomed.
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You can enter this uncrowded, interesting field. Defense expansion, new developments demand trained specialists. Study all phases radio & electronics theory and practice; TV; FM; broadcasting; servicing; aviation, marine, police radio. 18-month course. Prepare for good pay. Graduates in demand by major companies. High school or equivalent required. Begin January, March, June, September, Campus life. Write for catalog.
VALPARAISO TECHNICAL INSTITUTE
Dept. RD Valparaiso, Indiana

manufacturers of master amplified TV antenna systems, etc., has moved to new and enlarged quarters at 342 West 40th Street in New York . . . **AMPEX CORPORATION** has moved its southeast district office to the Howell House, 710 Peachtree Street, N.E. in Atlanta, Georgia . . . **NATIONAL RADIO DISTRIBUTORS** has moved its main Bronx store to larger quarters at 1165 Southern Boulevard. The new location provides nearly 10,000 square feet of space on a single floor.

ALFRED Y. BENTLEY has been appointed assistant manager of the Cathode-Ray Tube Division of **Allen B. Du Mont Laboratories, Inc.** He has been with the firm for ten years in various technical and administrative positions . . .

The board of directors of **Glass-Solder Engineering** has named **HUGH P. MOORE** president and general manager. He was formerly president of the **Acme Electronics** division of **Aerovox** . . .

ROBERT V. HOLTON is the new general manager of the electrical products division of **Minnesota Mining & Manufacturing Co.** He has been with the company since 1943. The company also named **DR. WILFRED W. WETZEL** to the post of general manager of its magnetic products division. He joined the firm in 1944 . . .

A. ELLIS JONES has been named manager of mobile and railroad sales for the **Bendix Communications Division** . . . **JACK S. BELDON** has been named manager of marketing for **General Electric's** radio and television department in Syracuse. He has had extensive experience in the merchandising field . . .

Spencer-Kennedy Laboratories, Inc. has appointed **WILLIAM K. HEADLEY** to the post of sales manager . . . **EARL OLSON** has been named vice-president in charge of operations at **Jensen Industries, Inc.** He has served as chief engineer of the phono needle firm since 1950 . . .

WILLIAM R. CROTTY has been promoted to the post of manager of radio and TV sales for **Erie Resistor Corporation's** Electronic Division. He joined the firm in 1939 . . .

WILLIAM O. HAMLIN has been named supervisor of technical information for **CBS-Hytron**. He was formerly technical editor of *"Sylvania News"* . . .

JOSEPH H. GILLIES has been appointed vice-president in charge of manufacturing for **Philco Corporation** in addition to his present duties as vice-president and general manager of the firm's Government and industrial division . . .

ROBERT RAYNOR has been named sales promotion manager to head the new merchandising department of **Clear Beam Antenna Corporation** and **Tempo TV**. He has been with **Clear Beam** for the past three years and will retain his present position as sales manager of the firm . . .

JOHN C. LEGLER is the new director of advertising and public relations for **Electronics Corporation of America** . . .

MAJOR GENERAL JAMES D. O'CONNELL has been confirmed as Chief Signal Officer of the Army replacing **MAJOR GENERAL GEORGE I. BACK** who is retiring from the Army. The new Chief Signal

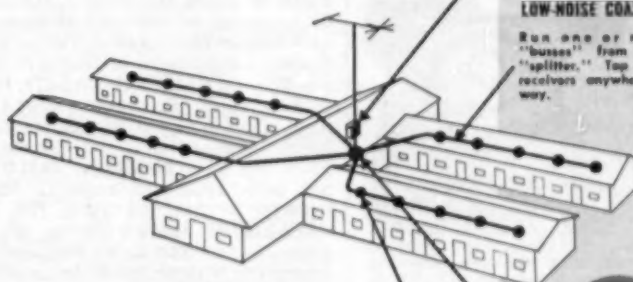
Officer of the Army replacing **MAJOR GENERAL GEORGE I. BACK** who is retiring from the Army. The new Chief Signal

Officer of the Army replacing **MAJOR GENERAL GEORGE I. BACK** who is retiring from the Army. The new Chief Signal

June, 1955

Most Economical SIMPLEST MASTER TV SYSTEM

to Sell... Install... Service



Jerrold TV Multi-Outlet SYSTEM

Master TV systems serving 5, 10, 20 or more receivers from a single antenna are easy—and profitable—to install, the Jerrold way! For Jerrold has engineered every component—right down to the easy-to-use, solderless coax connectors—to give each receiver beautifully clear, interaction-free, all-channel reception . . . the best the antenna can provide.

And with a Jerrold TV Multi-Outlet System every step of the installation, every calculation, is figured out for you. Cost estimates are a cinch. Investigate this profitable field now. Send for free catalog sheets describing all components.

more DB per Dollar Bill

JERROLD ELECTRONICS CORP.

1401 South 26th St., Philadelphia 46, Pa.



DISTRIBUTION AMPLIFIER

Amplifies antenna signal 25db, channels 2-13. Sensitive 5-tube cascade circuit. Input noise figure approaches theoretical minimum—only 6db. 75 or 300 ohm input. 72 ohm output to "Splitter" or distribution bus. Flat response for color.

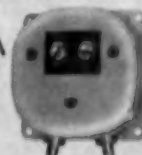
LOW-NOISE COAX

Run one or more main "buses" from amplifier or "splitter." Tap off individual receivers anywhere along the way.



LINE SPLITTER (H model)

Equally divides amplifier output 2 or 4 ways to feed distribution buses in various wings. No tubes. Cannot overload.



LINE TAP IMPEDANCE MATCHER

One for each receiver. Compensates for line response tilt. Completely isolates receivers from each other. Matches 72 ohm line to 300 ohm set. No tubes.

AND . . . for these Special jobs:

- ✓ Antenna-Mounted De-Snowder Pre-amplifier—for ultra-fringe areas.
- ✓ UHF Master Converter—for UHF reception on all VHF receivers.
- ✓ Closed Circuit TV—for hotels, conventions, etc. Easily added to any Multi-Outlet System.



BUILD the New TRANSVISION TV KIT

\$15⁰⁰
ONLY gets you started*



Designed so
that COLOR
can be added

*THIS MODEST INVESTMENT gets you started on a most fascinating project— assembling the new "E" type Transvision TV Kit in easy stages. For \$15 you get PACKAGE #1 (standard first package for all new "E" kits). This package gives you the BASIC CHASSIS and required first-stage TV COMPONENTS, with complete instructions. When ready, you order the next stage (pkg. #2), etc. All stages (or packages) are low priced, making your complete kit the best buy in TV.

YOU PROFIT 3 WAYS:

1 Learn TV

You learn TV the practical way — by doing. No previous technical knowledge is required. With Package #1 you get a complete Instruction Book; a 95-page Book of interesting, educational facts and explanation about TV, servicing, etc.; over 200 drawings and diagrams; and a 16-page booklet on Hi-Fidelity.

2 Save up to 50%

You build a TV set worth up to double your cost of the parts; and you learn how to save on servicing, too.

3 Prepare for COLOR TV

By assembling your own TV Kit, you will learn enough about TV to be able to make the necessary modification to add color. Transvision will supply the required components to make change over to COLOR practical and inexpensive.



FREE CATALOG Shows 8 Great TV Kits:
EXCLUSIVE: Only Transvision TV Kits are adaptable to UHF. Ideal for FRUIT SKEAL. No previous technical knowledge required. Write now!

MAIL THIS COUPON TODAY —

Educational Director
TRANSVISION, INC., NEW ROCHELLE, N. Y. Dept. RN-6.

☐ I'm enclosing \$_____ deposit. Send standard kit PACKAGE #1, with all instruction material. Balance C.O.D.
☐ Send FREE copy of your new TV Kit Catalog.

Name _____
Address _____
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Officer has served as Deputy since December, 1951 . . . **WENDELL TIETS-WORTH** has joined Sonotone Corporation as assistant sales administrator of the tube division. He was associated with General Electric for 20 years prior to accepting his new post . . . **ALEXANDER M. PONIAOFF** has been elected founder and chairman of the board of directors of Ampex Corporation. **G. I. LONG** has been named to succeed him in the presidency . . . **WALTER F. MARCH** has been named vice-president in charge of sales for Lab-Tronics, Inc. of Chicago. He was formerly associated with Allied Radio Corp. in Chicago . . . **VICE ADMIRAL JOHN B. MOSS** (U.S. Navy, Ret.) has been elected to the post of president of Hoffman Laboratories, Inc., a wholly-owned subsidiary of Hoffman Electronics . . . **HANNIBAL CHOATE FORD**, founder of the Ford Instrument Company, died recently at his estate at Kings Point, Long Island. He was 77 years old . . . **ROBERT L. JABLONSKI** has been appointed national service manager of Hoffman Radio Div. He will make his headquarters in Los Angeles . . . **EDWARD R. WAGENHALS** has joined the Cleveite-Brush Development Company as vice-president and director of components development . . . **HOMER O. SAMS**, sales research director of Howard W. Sams & Co., Inc., passed away recently after a short illness. He was 61 years old and had been associated with the firm for the past eight years.

RETMA reports that the radio-TV set production figures for February have increased both over those of January and over February of last year. During the month 702,514 TV sets were produced while 1,089,724 radio receivers rolled off the production lines—a healthy increase over the 769,232 last February and 1,068,146 produced in January of this year.

"Souped-Up Viking I"

(Continued from page 68)

listening to words and syllables that have a depth of amplitude. That is what creates, in part, what we call intelligence of speech. If we take the same words and syllables and try to create a falsetto by making their amplitudes all equal or near so, then we no longer have good intelligence. It becomes a new "noise" or anything else you care to call it. Intelligence is often lost because of the "unnaturalness." Definitely, we hear a louder signal (noise) but is the readability any better? You may sound louder but not necessarily clearer.

So to all you "hot-rodders" may your transmitters take on a new zest for life. You now have a "new" transmitter and this should keep you happy for a few months until someone else finds a better way or has another thought. May your "Vikings" purr along as well as mine does for many years to come.

WRITE FOR OUR 1955 CATALOG

APN-1 Altimeter Indicator, basic movement
0-1 ma. 5 ma. shunt, 250° dial. New \$ 2.95
Precision Mod. E400PM Sweep Generator
FM-TV A.M. New 99.90
TS123/UR Frequency Meter, 20-400 mc. Exc. 310.00
TS173/UR Frequency Meter, 50-450 mc. with
modulation and PP70/UR Power Supply
Exc. 350.00
LM Frequency Meter with Mod. 125KC.
20mc. Exc. 99.50
LM 110V. AC Power Supply Exc. 45.50
RA-38 Power Supply 115VAC, 60 cy. input,
1500VDC 500 ma. output Exc. 350.00
IE36 Test Set used for bench testing of
SCR-322
With 1-30A meter 32.50
Less 1-30A meter 24.95
General Radio 620A Hetrodyne Frequency
Meter 300 ka. to 300 mc. Exc.
IE-10A Test Set for SCR-522 etc. 100-150
mc. loss tools Exc. 200.00
TS-35/AP Power Meter freq. range 8700-
9500 mc. Exc. PUR*
Waton Model 686 True Mutual Conductance
Vacuum Tube Tester New 450.00
R65/APN5 Loran Receiver-Indicator
Like New PUR*
AN/APN-4B Loran Set with 1200B/APN4
Indicator R65/APN4 Receiver, Crystal
Mounts, Plug, and Manual New 120.00
PE-206 Inverter New 14.95
RT18/ARC1 Transmitter-Receiver with tubes,
dynamotor, 100-150 mc. 10 channel. Exc. PUR*
T67/ARC3. TCS, BC348, TS-323, LM, IE-
10A, APA10, etc. PUR*
*PUR—Price Upon Request.

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Mac's Radio Service Shop

(Continued from page 72)

and other such defects without ever stepping off the ground."

"Speaking of stacking," Barney offered with a faraway look in his eyes, "How's about my borrowing those binoculars to take with me to Ideal Beach some Sunday? Some of the babes you see over there are really stacked, and—"

"Never mind!" Mac hastily interrupted. "You can get into enough trouble with just your bulging baby blue eyes."

"There's still that biggest package," Barney reminded.

Mac opened the end of the cardboard carton that folded out to form a carrying handle and lifted out a small round picture tube.

"Is that a scope tube?" Barney wanted to know. "It's shaped more like a picture tube, but surely we haven't got any sets in the store with that small a screen."

"This tube," Mac said with a quizzical grin, "is designed to replace magnetically-deflected picture tubes up to twenty-four inches or so."

"Oh yeah; then it must be made of rubber," was Barney's dubious comment.

"No, it's Sylvania's new 5AXP4 Television Receiver Check Tube that was described in the February, 1955, 'Sylvania News.' It is intended to replace almost any picture tube you are likely to find in a modern black-and-white TV receiver—but only for testing purposes, of course. It will take anode voltages up to 18,000 volts, requires no ion trap, and is self-focusing. You know I've long wished we could use the fast, reliable, conclusive tube-substitution method of checking the picture tube that is so useful in checking the other tubes in a TV set. Now, thanks to this little job, we can."

"How do you use the tube?"

"Just slip the receiver's yoke over the neck of the tube, put the picture tube socket on its base, and connect up the high-voltage lead. The manufacturer suggests using one of those centering-magnet assemblies with the magnets removed to hold the tube in position in the yoke. This assembly clamps the neck of the tube between flat springs so that it will stay in position."

"That will be pretty handy," Barney said with mounting enthusiasm. "It means we can leave the picture tube right in the cabinet in most cases when we are sure there is nothing wrong with the tube itself and bring only the chassis and deflection yoke to the store. That will be a real help. I never did relish the idea of lugging those big tubes around. There's too much danger of breaking them. On top of that, they're heavy and hard to get out."

"Don't overlook the sales appeal of

A TERRIFIC BUY!

TS-100/AP 'SCOPE



One of the most sensational values ever offered! Circular sweep, rate 1.5 microseconds per inch, 12.5 microseconds per revolution. Linear sweep, rate 12, 120 and 360 microseconds for 3" sweep. Self-contained in metal case 8 7/8" x 10 1/2" x 10 1/2" deep. For 110V 50 to 1200 cycles AC. Demilitarized, NEW, with all tubes including crystals and C.R. Tube. **\$34.50**

OUR LOW PRICE

FLS-A RADIO FILTER, Used.....\$1.99

New.....\$2.45

HEADPHONES

Model	Description	Excellent Used	BRAND NEW
HS-23	High Impedance.....	\$2.25	\$4.35
HS-33	Low Impedance.....	1.79	4.65
HS-30	Low Imp. (featherweight).....	1.49	1.89
H-18	High Imp. (8 ohm).....	1.49	1.89
CD-307A	8 cords, with FLS plug and 2500 Jack.....	2.75	7.95

NAVY RECEIVER TYPE ARB

Four Band, 105 to 9050 Kc. Low Freq. Bkpf. Broad-cast—40 and 60 meters. Includes tubes and dynamometer for 24 volt operation. Easily converted for 110 V., 12 V. or 6 V. Schematic included. Excellent Condition. Overall 8 1/4" x 7 1/4" x 15 1/4". Wt. 200 lbs. Special **\$18.65**

MICROPHONES

Model	Description	Excellent Used	BRAND NEW
T-17	Carbon Hand Mke.....	\$2.45	\$4.35
T-30	Carbon Throat Mke.....	.33	.50
T-48	Navy Lb. Mke.....	1.50	1.85
TS-38	Navy Type.....	1.00	1.35
T-24	Carbon Mke.....	1.00	1.35



TG-34A CODE KEYS

Self-contained automatic unit, reproduces code practice signals recorded on paper tape. By use of built-in speaker, provides code-practice signals to one or more persons at speeds from 5 to 25 WPM. BRAND NEW, in original carton. **\$18.88**

SYNCHRONOUS SELSYNS

Specially priced! Mfd. by Diehl and Bendix. Brass case, 6" long, 2 1/4" dia. For 110 Volt 60 Cycle AC. Quantities available. BRAND NEW, in original carton. Transmitter each **\$8.95** Repeater each **\$8.95**

TRIPLE GEARED GENEMOTOR

Originally used for automatic bar-becues. 18 volts input, 450 volts at 500 amps output, 4200 RPM continuous duty motor, with reduction gears for 180, 26 and 7 RPM. Overall 11" long, 6" wide, 4" high. A E.A.R. GAIN AT THIS LOW PRICE! **\$3.95**



POWERFUL MAGNET

Wonderful for experimental! Has terrific pull! Solid metal, 5 1/2" high, base 8 1/2" x 2 1/2". Gap between poles 1 1/2". Value \$25.00. COMPARE OUR LOW PRICE! **\$5.88**

DYNAMOTORS

Type	Input	Output	Excellent Used	BRAND NEW
DM-32A	25V 1.1A	250V .05A	2.95	7.95
DM-34B	12V 2.5A	220V .000A	1.55	.....
DM-36	25V 1.4A	220V .000A	5.55	.....
DM-37	25V 9.2A	425V .225A	12.55	.....
DM-28	25V	224V .07A	1.95	4.95
DM-63A	25V 1.4A	220V .000A	2.95	6.95
DM-33A	25V 5A	575V .16A	.....	.....
	25V 7A	540V .25A	1.95	3.95

GOLD PLATED SPECIAL!

TS-1/ARR-1 PORTABLE TEST

OSCILLATOR. Complete with two 9.5 tubes and cavity. BRAND NEW, in metal housing 9 1/4" x 8 1/4" x 3 1/4". \$3.99

2 1/2" high. OUR LOW PRICE!.....\$3.99

GOULD 6-VOLT STORAGE BATTERY

10 Amp. Hour Rating. Navy Standard. Black Rubber Case. BRAND NEW.....\$5.95

WILLARD 6-VOLT MIDGET STORAGE BATTERY

2 Amp. Hour. BRAND NEW. 2 1/2" x 1 1/2" x 3 1/4". Uses Standard Electrolyte.....Only \$1.68

WILLARD 2-VOLT STORAGE BATTERY

30 Amp. Hour. BRAND NEW. Transparent Plastic Case.....\$1.95

1-QUART ELECTROLYTE, enough for two cells. Bottle.....\$1.40

"ONCE-IN-A-LIFETIME" BUY!



MODEL BC-453 RCVR COMMAND SETS

170 to 550 Kc

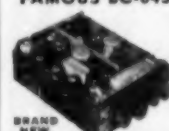
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\$12.95

COMPLETE WITH ALL TUBES.....

Type	Description	Excellent Used	BRAND NEW
BC-446	350 to 1500 Kc. Broadcast
Rev. incl. Tubes	.....	.....	.....
BC-453	Rever. 100-550 Kc.	\$14.95	\$12.95
BC-454	Rever. 3-6 Mc.	8.25	9.95
BC-455	Rever. 6-9 Mc.	8.75	12.45
BC-456	Modulator	.....	2.45
BC-457	Xmitr. 4-3.5 Mc.	11.65	14.00
BC-458	Xmitr. 3-3.7 Mc.	7.95	12.05
BC-459	Xmitr. 4-9.1 Mc.	11.95	15.05
BC-460	3-Rever. Control Box.	1.40	1.90
BC-461	Xmitr. Control Box.	1.35	1.40
BC-466	Xmitr. 3-4 Mc. Incl. ....	.....	.....
Tubes & Xtl.	.....	33.65	.....
1-Receiver Rack	.....	1.70	2.00
2-Transmitter Rack	.....	1.90	2.25
Single Transmitter Rack	.....	.....	2.25

FAMOUS BC-645 XMITTER-RECEIVER



Makes wonderful mobile rig for 450-500 Mc. Easy to convert for phone or CW 3-ray communication. CONVERSION DIAGRAM INCLUDED. This swell rig originally cost over \$1000—yours for practically a song! You get it all, in original factory carton. BRAND NEW **\$29.50**

power supply. Ship. wt. 25 lbs.

PE-101C DYNAMOTOR for BC-645, has 12-24V input (easy to convert for 6V Battery) **\$6.95**

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UHF ANTENNA ASSEMBLY, **\$2.45**

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BC-221 FREQ. METER CASE



Aluminum case for BC-221 or TS-164 Freq. Meters. With volt. reg. supply using YH105, 2 ballast tubes, relay, cable, etc. Inside front 10 1/2" x 7 1/2" x 2 1/2" deep. Shock mounted. BRAND NEW, in original packing! **\$3.95**

BC-375 and BC-191 XMITTERS

200 to 500 KC., 1500 to 12500 KC., using plug-in units shown below. 100 Watts, Voice and CW. Used. Your Choice, either type.....Each **\$26.95**

Tuning Units for BC-375 and BC-191

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TU-5	1.5 Mc to 3 Mc.....	\$4.95	\$3.95
TU-6	3 to 4.5 Mc.....	4.95	3.25
TU-7	4.5 to 6.2 Mc.....	2.75	2.25
TU-8	6.2 to 7.7 Mc.....	2.95	2.25
TU-9	7.7 to 10 Mc.....	2.95	2.25
TU-10	10 to 12.5 Mc.....	2.95	2.25
BC-306	Antenna Tuner.....	3.45	2.45

BENDIX DIRECTION FINDER

MM-26-C, 12-tube remote control. Navigational Direction Finder and communication receiver. 150 to 1500 Kc in 3 bands. 200 V. DC Input. Ideal for commercial navigation on boats and planes. Installation complete! **\$16.50**

MM-26-C Receiver complete with 13 tubes.....\$4.25

MM-26-C Portable Loop.....\$4.25

MM-58 Altimeter Control Box.....\$4.95

BEACON RECEIVER BC-1206-C

Complete with 5 tubes, Tuning 105 Kc to 450 KC. 1-P Frequency—135 KC. Receiver Sensitivity—3 Microvolts for 10 Milli-watts output. Output Impedance—300 Ohms and 450 Ohms. Volume Control—RF Gain Control. Power Supply—24-28 Volts. Aeromarine Battery, Current—75 Amperes. BRAND NEW, with Tubes..... **\$9.95**

Used, with Tubes.....\$6.95



FAIRCHILD Bubble Sextant

Actually worth \$150 or more! Has illuminated averaging disc for nighttime use. Complete with carrying case, recording discs, flashlight with rheostat for using sextant at night, 2X telescope for faint stars, and Allen wrench. Only.... **\$9.95**

Complete

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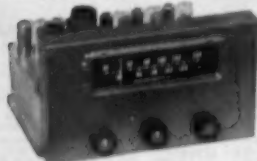
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NEW FM TUNER KIT

New, decorative gold front. New chassis. Front end—3 mv sensitivity. IF amplifier mounted, wired and tested in the chassis. You mount completed RF tuning unit and power supply. 11 tubes, 20 to 20,000 cycle response. A.P.C. and switch, size: 12 1/2" x 9 1/2" x 7 1/2" high. Shipping weight: 15 pounds. Manual supplied. Gold screen cover available at \$3.50 extra.

PRICE:

\$59.50



NEW FM-AM TUNER KIT

New, decorative gold front like FM tuner above. New chassis front end on FM—3 mv sensitivity. 13 tubes. Compresses chassis, power supply, parts. AM unit, FM unit, IF amplifier, all wired and tested, ready for mounting in chassis. A.P.C. with switch. Kits include all parts and hardware. Size: 14" x 12" x 7 1/2" high. Shipping weight: 19 pounds. Manual supplied. Gold screen cover available at \$3.50 extra.

PRICE:

\$82.50

FMF-3B Tuning Unit with Cascade
Permanently tuned, 3 tubes, APC, 0 microvolts sensitivity. May be used with any 10.7 MC IF amplifier such as our IF-6, 3 pounds.

\$19.50

AM-4 Tuning Unit

3-gang tuning condenser. Unit covers 550 to 1600 KC. Completely wired and tested with tubes, 4 tubes. Chassis plate measures: 4" x 7 3/4". 3 1/2 pounds.

\$24.50

IF-6 Amplifier

0 tubes, 10.7 MC. Low distortion, high gain. 3 pounds.

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Amount for kit \$

See weights, add shipping cost \$

Total amount enclosed \$

☐ Check ☐ Money Order

WHEN YOU THINK OF TUNERS,
THINK OF
COLLINS AUDIO PRODUCTS

this little service tool," Mac said as he used his pocket steel tape to prove the tube face was only five inches in diameter and the over-all length was but ten and a half inches. "When we can show our customer that his set can put out a bright sharp picture on this tube while the picture he gets on his own is weak and faded, if he gets any picture at all, his sales resistance will evaporate. This little persuader will present a much more graphic and convincing argument in favor of ordering a new tube than will a mere meter reading on a tube tester.

"I think this test tube will be especially appreciated by small shops such as we are," Mac went on. "We can't carry a large inventory of picture tubes; so usually we do not have a good tube to try in one of those hard-to-be-sure cases where you feel reasonably confident the picture tube is at fault but you want to be dead-certain before telling the customer a new tube will cure his trouble. This 5AXP4 will take care of those cases for us."

"Changing the subject for a moment," Barney said, "didn't I see Jim taking his recorder out with him? What was wrong? That about had you stumped yesterday."

Mac smiled broadly as he replied: "Yes, that was Jim, and the mystery is solved. What puzzled me, you'll remember, is how the recorder could possibly do what he reported it was doing; namely, suddenly go berserk during playback and erase recorded material while it was playing it and leave only a wavering audio note in its place. He said a recording might sound fine the first two or three times he played it, but the next time he wanted to listen, only this note could be heard—and that was all I could hear when I put one of his tapes on our recorder, too.

"Jim's hobby is recording circus bands—he used to be with a circus, you know—and several of his prized and irreplaceable recordings were ruined by this strange fault of his recorder. What made the thing worse was that I could not make it happen here in the shop. I made a test recording and played it over and over without anything unusual occurring. Finally, while lying in bed last night, I got an idea of what might be happening; and the first thing this morning I tried it out. Sure enough, I could make the same thing happen to the test recording that had been happening to Jim's calliope music."

"What was wrong?" Barney demanded impatiently.

"You'll remember his recorder has two control knobs. One has Play-Off-Record positions; the other reads Wind-Off-Rewind. A red button must be pushed down before the first knob can be turned to Record, and it is held depressed as long as this knob stays in the record position but snaps back up when the knob is turned to Off. Neither knob can be turned from the Off position unless the other knob is

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Rig up your own TV watchdog for swim pools and other uses—plus training and experimental work. 18-40 lens, 6-stage video amplifier and clipper. Write for complete technical data. Now SOLD AT FRACTION OF FORMER PRICE!

RCA TYPE 308-A FIELD INTENSITY SET TS-481/U

Overall frequency range in 6 bands, 540-16,000 Kc. Field intensity range 80 microvolts to 20 V. per meter. Excellent condition. COMPLETE WITH ONE 12DP1. Less power supply. Shipping wt. **\$295.00** 48 lbs. Limited quantity.....

TS45/APM X-Band Signal Gen.

Prove small labs, schools and service shops. Hurry—while they last! New Low Price..... **\$69.50**

NEW 24 V TRANSFORMER & RECTIFIER COMB. a base 24V. DC power supply of 110V AC primary. 24V secondary and 600mA rectifier. Operates intermittently up to 1 or 2 amps. **\$2.95** Ship. wt. 3 lbs.....

1-222 SIGNAL GENERATOR-MICROVOLT Pres. range 0.1 to 150,000 MC. Complete with all tubes and 5 MC Calibrating Crystal. Self-contained 110 V. and 60 cycle power supply. With schematic. Excellent cond. Good the Govt. approx. **\$399.50** \$700.00. ONLY.....

ADF AUTOMATIC DIRECTION FINDER RECEIVER

Model CAATC-500, Mark I mfg. by Sperry Gyroscopes. Self-contained, 12 V. vibrator supply. This unit is used by major airlines. Pres. range: 200-500 Kc. AND 550-1500 Kc. Complete with all tubes. Used, good cond. Ship. wt. **\$249.50** 65 lbs.....

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RADIO & TELEVISION NEWS

already in that position. However, the red button can be held down manually while the Rewind-Wind knob is worked.

"That's what I did. I simply held this red button down while I was re-winding the tape. This activated the record and erase heads and wiped the recording from the tape. At the same time the signal from the bias oscillator was put on the tape. Remember that the tape was travelling at about ten times its ordinary speed. As you know, slowing down the speed of the tape below the speed at which it was moving when a recording was being made has the effect of lowering the pitch of the recorded material. In this case, when the tape was played at normal speed, the supersonic erase signal that was recorded during fast rewind was brought down into the audible range and provided that mysterious wavering note we heard."

"What was Jim doing wrong?"

"Since he only used the recorder once or twice a year, he forgot how to operate it from one time to the next. He remembered, though, that the red button had to be depressed under some circumstances; so he just depressed it every time he moved any of the knobs. During rewind he held the button down so that he would not hear the normal monkey-chatter you get when the tape is moving fast and the speaker is not cut out or the volume turned down. Sometimes he pushed it far enough to engage the recording switch; other times he did not. I simply had him show me how he operated the recorder before I told him what I had found out; and sure enough, that is what he was doing. I've got him all squared away now, and he says he will see I get a couple of passes the next time the circus hits town. If a certain obstreperous redhead that I know doesn't consider such entertainment beneath his dignity, I'd be glad to include him in this bucolic whingding upon request."

"It's a date!" Barney exclaimed. "I'll buy the peanuts."

-30-

"TAPE OF THE MONTH"

A RECORDED TAPE of the Month Club has been organized recently for the purpose of supplying, on a monthly basis, selections of classical music, pops, satire, comedy, operatic, and folk music on 1200-foot, 7-inch reels of magnetic tape.

A special feature of the Club is the monthly "Preview" tape which is included as one of the services offered for the six-month membership charge of \$2.00. The "Preview" tape contains highlights of the forthcoming month's selection and is recorded on a 4-inch reel.

Each member agrees to order at least two regular monthly selections at the special member's price during the six month period. For every three selections ordered by a member, the selection of a free bonus tape is offered.

The Club will supply full details on the plan. Write Recorded Tape of the Month Club, Inc., P. O. Box 195, Radio City Station, New York, New York. -30-

June, 1955

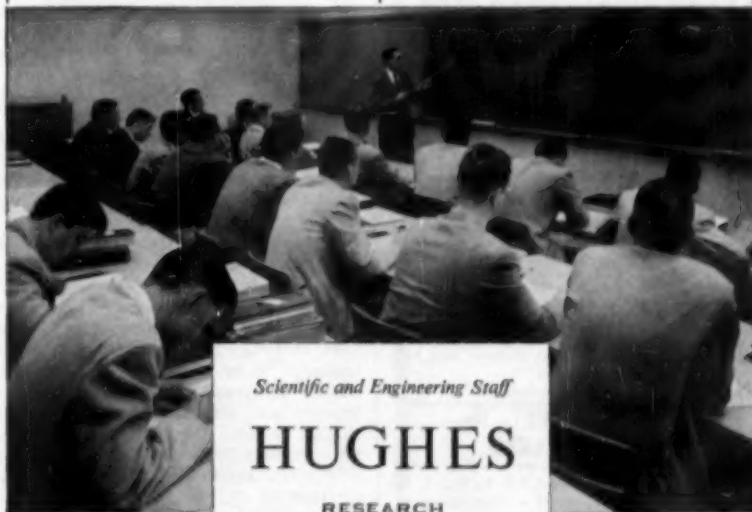
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New COLLINS 75A-4 Receiver

Designed for AM, CW and selectable SSB reception. Covers 160, 80, 40, 20, 15, 11 and 10-meter bands. Features include: double conversion — thermally sealed VFO — mechanical filter in IF strip — separate detectors for SSB and AM — band-pass tuning — new noise limiter — bridged-T rejection notch filter — built-in crystal calibrator — provision for 3 Collins plug-in mechanical filters. Complete with tubes (less speaker).....\$595.00

Model 312A-1 Control/Speaker for above in matching cabinet..... 37.50

New COLLINS KWS-1 Transmitter

A top performing transmitter having 1kw power input on CW or single tone test SSB operation, and 650 watts on AM with carrier and 1 sideband. Consists of Collins 32W-1 Exciter with its power supply replaced by a 367A-1 linear RF Power Amplifier, plus a 428A-1 High Voltage Supply and 429A-1 Low Voltage Supply housed in supporting cabinet. Covers 80, 40, 20, 15, 11 and 10-meter bands. Pi-L tank circuit designed for continuous tuning over entire frequency range. RF amplifier employs 4X150A tubes operating push-pull AB₁. Other features identical to those of 32W-1.

Complete with tubes.....\$1995.00

CENTRAL ELECTRONICS New BROAD-BAND LINEAR RF AMPLIFIER Model 600L

Has no tuning controls except a single knob band selector from 10 thru 160 meters. Requires only 2 watts effective or 4 watts peak envelope drive power for 500 watts dc input. New band-pass couplers provide 60 to 65% linear efficiency. Uses single 813, class AB₁, and has automatic relay to protect 813 and RF couplers.

New meter reads: input power directly in watts ... grid current ... output in RF amperes ... reflected power with mismatched load ... input level for AM, FM and CW.

Has built-in power supply with regulated bias and screen voltages. Effectively TVI-suppressed. Has shielded RF compartments.

Available in either table or rack model. Complete (factory-wired).....\$349.50

CENTRAL ELECTRONICS Model 20A MULTIPHASE EXCITER

20 watts peak output on AM, FM, CW and SSB. Has single switch for sideband selection. ... VFO on AM, FM and SSB, plus break-in operation on CW ... band-switching, 160 thru 10 meters ... magic eye indicator for carrier null and peak modulation ... plus many other features. Choice of table or rack model.

Wired.....\$249.50 Kit.....\$199.50

New ELDICO VFO 10/20A

Variable frequency oscillator designed for Central Electronics SSB Exciters 10A, 10B and 20A covers 80 and 20 meter bands. Has 4-inch dial with 5 inches of bandspread on 75-meter phone band and 3 inches on 20-meter phone. Electrically stable circuit employs high-Q inductor and a precision geared tuning condenser. There are no tubes in the VFO proper to cause drift. An oscillator unit plugs into octal socket on C.E. Exciters. Single coax line connects exciter to the VFO.

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Distortion/Power Adapter (Continued from page 55)

The use of black decals to mark the switch positions and the jacks, and grey National HR knobs, help to give the adapter an attractive, "professional" appearance.

The procedure for using the distortion/power adapter is simple and straight-forward. To explain its use, assume that the first amplifier to be checked is one that is rated at ten watts and that the 16-ohm output tap is selected. For the first test the balance control, R_b , should be set at maximum resistance.

The 16-ohm terminals of the amplifier are connected to a plug which fits into the "Amp" jack of the adapter and the a.c. v.t.v.m. is connected to the "Meter" jack. It is best to use shielded wire for these connections. The test oscillator, set to 400 cycles, is connected to the input of the amplifier. The load selector switch, S_1 , is set to "16", and S_2 , the meter switch, to "Pwr."

As the table indicates that for ten watts the voltage across a 16-ohm load resistor is 12.6 volts, with the gain control of the amplifier full on, the output of the oscillator is adjusted for a meter reading of 12.6 volts.

Next, the meter switch is turned to "Set" and the meter-set control, R_s , adjusted for a meter reading of 10 volts. (Had the voltage across the load, as determined from the table, been less than ten volts, then a meter reading of one volt would have been used for the meter-set adjustment.) Set the meter switch to "Read." Now carefully vary the frequency of the test oscillator for the lowest possible meter reading. By adjusting the balance control this reading should be further reduced. The correct setting of the balance control and the oscillator frequency dial is where the minimum voltmeter reading is obtained.

No further adjustment of the balance control should be necessary.

Assume the minimum is .5 volt. As 10 volts (due to the adjustment of the meter-set control) represented ten watts, or 100% output, then .5 volt equals 5% of the output. This 5% is the harmonic distortion of the amplifier at ten watts output.

As this 5% measurement includes the test oscillator harmonics and the noise voltages of the amplifier, it is obvious that in order for the harmonic measurement to be accurate, the oscillator should be reasonably free from harmonics and the amplifier noise level should be low. Do not attempt to test an amplifier for distortion until excessive hum, tube, and circuit noise are eliminated.

Four hundred cycles was chosen as the test frequency as the second and third harmonics (800 and 1200 cycles) lie within the most sensitive frequency range of the ear, making these harmonics the most annoying. With the choke and capacitors specified, the

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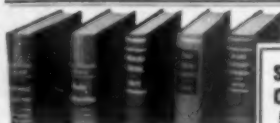
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usual commercial tolerances may result in a test frequency somewhat different from 400 cycles. In practice, this is of little importance.

Now that the amplifier has been tested, the next step is to make the usual resistance and voltage measurements and adjustments in the circuit to determine if the distortion can be reduced. Since the effect of each change made in the amplifier circuit can be easily checked, troubleshooting even small amounts of distortion becomes a simple step-by-step process.

Although this adapter will not take the place of a good-quality intermodulation or harmonic distortion meter, its small size and ease of operation make it well worth-while where more elaborate instruments cannot be justified due to their size and cost.

INTERNATIONAL YLRL MEET

THE Los Angeles Young Ladies Radio Club, with Mildred Griffin, W6PJU, president and official hostess, will sponsor the first international YLRL convention June 24, 25, and 26 at the Miramar Hotel in Santa Monica, California.

The affair promises to be an interesting one, both from the standpoint of the program that has been planned and because of the fact that licensed women radio operators from Africa, Hawaii, Canada, and all U.S. districts will attend. The League membership now numbers more than 600 women in the U.S., Alaska, Hawaii, Canal Zone, Canada, England, France, Italy, Africa, Belgium, Netherlands, Australia, and New Zealand.

Vada Letcher, W6CEE, is national YLRL president this year and will preside at this unique convalesce.

The program includes a reception and registration on Friday (June 24); luncheon, business meeting, and program Saturday noon with a YL/OM banquet Saturday night; a beach picnic at Santa Monica Bay on Sunday; and a tour of Hollywood tourist spots on Monday morning.

The registration fee is \$10.00 for the gals with the husbands being included in the banquet activities upon payment of a \$5.00 fee. Contact Gloria Mataska, W9YBC, the publicity chairman of the event, for further information.

Vada Letcher, W6CEE, national president of the Young Ladies Radio League, boards the plane to fly to San Francisco to extend a personal invitation to the S.F. unit to attend the International Convention which will be held June 24, 25, 26 in Santa Monica.



ARMY AIRCRAFT RECEIVER ... BC-946B

Covers 520 Kc to 1500 Kc Broadcast Band. Tubes: 3-12SK7, 1-12SR7, 1-12A6, 1-12K8. Designed for dynamotor operation; can be easily converted to 110 volt or 32 volt use. Two IF stages. Threeway tuning cond. BRAND NEW, in sealed carton, with tubes, less dynamotor.....**\$29.95**

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Can be easily converted to a four speed motor. Approx. 11" long, 1/20th horsepower, 115 V, 50/60 cycle. AC motor with integral gear box having four 1/4" drive shafts turning simultaneously at the following speeds: 4000 RPM—grinders, buffers, flexible shaft tools, etc.; 150 RPM—wrapping fishing rods, slow speed tools; 25 RPM—dev. tray rocker for photo darkroom; 5 RPM—turning barbecue spits, edis. displays.

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Amplifier, pre-amplifier, or 8 station intercom. Up to 8 input and output circuits. Requires simple power supply for operation. Complete with tubes in sturdy metal case.
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BC-1206 Beacon Receiver Complete with 5 tubes, tunes 195 KC to 420 KC, Volume control—RF gain control. Power supply 34 to 28 volts, Wt. only 4 lbs.
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TS 255 X band freq. meter, power meter & signal generator. Power measuring bridge pulse or CW freq. 9990 MC-9017 MC. Excellent.....**\$195.00**



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7401 7402 7403 7404 7405 7406 7407 7408 7409 7410 7411 7412 7413 7414 7415 7416 7417 7418 7419 7420 7421 7422 7423 7424 7425 7426 7427 7428 7429 7430 7431 7432 7433 7434 7435 7436 7437 7438 7439 7440 7441 7442 7443 7444 7445 7446 7447 7448 7449 7450 7451 7452 7453 7454 7455 7456 7457 7458 7459 7460 7461 7462 7463 7464 7465 7466 7467 7468 7469 7470 7471 7472 7473 7474 7475 7476 7477 7478 7479 7480 7481 7482 7483 7484 7485 7486 7487 7488 7489 7490 7491 7492 7493 7494 7495 7496 7497 7498 7499 7500 7501 7502 7503 7504 7505 7506 7507 7508 7509 7510 7511 7512 7513 7514 7515 7516 7517 7518 7519 7520 7521 7522 7523 7524 7525 7526 7527 7528 7529 7530 7531 7532 7533 7534 7535 7536 7537 7538 7539 7540 7541 7542 7543 7544 7545 7546 7547 7548 7549 7550 7551 7552 7553 7554 7555 7556 7557 7558 7559 7560 7561 7562 7563 7564 7565 7566 7567 7568 7569 7570 7571 7572 7573 7574 7575 7576 7577 7578 7579 7580 7581 7582 7583 7584 7585 7586 7587 7588 7589 7590 7591 7592 7593 7594 7595 7596 7597 7598 7599 7600 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Manufacturers' Literature

PHILCO PARTS CATALOGUE

A new type of parts and accessories catalogue is currently being offered all Philco dealers and technicians by the Accessory Division of Philco Corporation, of Philadelphia.

The catalogue contains part and accessory descriptions, ordering and price information, technical data, and display material arranged in an attractive format.

Current information on all products, including over 24,000 of the company's service and universal replacement parts, as well as other makes of electronic and appliance products, has been catalogued by part number for convenience in ordering.

Philco distributors are handling this catalogue.

GERMANIUM DIODE DATA

The Semi-Conductor Division, International Rectifier Corporation, 1521 East Grand Ave., El Segundo, Calif., has published a new bulletin, GD-2, which lists the ratings and specifications on the company's line of germanium diodes.

It describes the firm's complete line of point-contact diodes and offers specifications on high-temperature, computer, u.h.f. mixer, meter protection, and general purpose units. A complete interchangeability and replacement chart is also included.

This bulletin is available only on letterhead request direct to the manufacturer.

REPLACEMENT FLYBACKS

Triad Transformer Corporation, 4055 Redwood Ave., Venice, Calif., has available copies of its television replacement guide, TV-55.

Included in the listing are six new correct replacement flyback transformers which have been designed to be interchangeable with original equipment found in Zenith, Muntz, Crosley, Sentinel, Hallcrafters, Admiral, and RCA receivers.

Model numbers and chassis for which the new transformers are suitable are listed in the guide, which is available on request.

MICROWAVE SYSTEM

The Engineering Products Division, Dept. P-420, Radio Corporation of America, Camden, N. J., has issued a comprehensive "guidebook" to the nature and applications of the first microwave system designed for use in the unused frequency band of the microwave spectrum, 2450-2700 mc.

The booklet describes the recently-announced MM-25 microwave system

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Kit "B"—DI LUXE CONE KIT—Same as above, containing larger variety of 20 cones . . . \$2.95
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KIT "D"—BOTH KITS "A" & "C" FOR ONLY \$3.95
HEAVY DUTY RECORDING MOTOR—RM-4 type—silent operating. Identical to RCA Victor 4500. 1/16" O.D. shaft. Overall 3 1/2" sq. x 3 1/2" deep. Less mtg. plate assembly . . . \$4.95
WOOD CABINET & CHASSIS FOUNDATION—Handsome walnut veneer. Inside 11 1/2" x 7 1/2" x 1 1/2". 4" sq. dial opening. Right. PLAS matching 4" tube mounted chassis . . . Set \$3.95

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RADIO & TELEVISION NEWS

which makes available 250 mc. of uncrowded channel space, provides up to 30 voice channels, and permits establishment of new microwave stations in geographic areas already closed or crowded.

The publication also illustrates how up to nine parallel duplex systems can be used in this frequency range in a given locality to meet requirements of utilities, pipeline operations, railroads, turnpikes, and commercial carriers.

SOUND EQUIPMENT

Altec Lansing Corporation, 9356 Santa Monica Blvd., Beverly Hills, Calif., or 161 Sixth Ave., New York 13, N. Y., has just issued a complete engineering catalogue especially for professional sound equipment users.

The new publication contains complete technical data on all of the company's sound products. It covers AM-FM tuners; transcription reproduction arms; twelve different broadcast, p.a., and scientific microphones; more than twenty amplifiers and preamps, power supplies, control consoles; and nineteen different speakers, horns, cabinets, and matching transformers.

Distribution of this catalogue is limited to professional users and is available from the company direct or from the firm's sound contractors.

ELECTRONIC TIMERS

A 5-page brochure with current information describing the standard line of electronic timers manufactured by *G. C. Wilson & Co.*, 1950 8th Ave., Huntington, W. Va., is now available on request.

Included in the line are delay, repeat cycle, and interval timers, all of which are available as stock items.

CUSTOM TV DATA

A new booklet which suggests ways to custom-install television receivers has been published by *Conrac, Inc.*, of Glendora, Calif.

Entitled "A Fleeting Glance at Fleetwood Custom Television", the booklet presents ideas for installations in every room of the house. Photos of installations feature both remotely- and conventionally-controlled receivers. Among such examples is a TV set in the bedroom wall with a tuning unit in the bed headboard.

AUTO REPLACEMENTS

A new automobile radio replacement guide, #3, is now available from *Merit Coil and Transformer Corp.*, 4427 North Clark Street, Chicago, Ill.

The new catalogue lists replacements for all model cars up to and including 1955 and also features the company's line of vibrator transformers, speaker outputs, and i.f. and r.f. transformers.

TV TUBE CHART

CBS-Hytron of Danvers, Mass., has announced the availability of a Second Edition of its "Substitution Chart for TV Picture Tubes."

This newly-revised chart provides all

NEW STOCK OF FIRST QUALITY TELTRON TUBES GUARANTEED! . . . LOWEST PRICES EVER!

All tubes individually boxed . . . unconditionally guaranteed for one year!

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This Eico Tube Tester is yours FREE when you buy \$199 worth of tubes or more within 60 days at Teltron.

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Type	Price	Type	Price	Type	Price	Type	Price
1A7GT...	.53	6AV5GT...	.60	6K7...	.40	12BA7...	.58
1H5GT...	.51	6AV6...	.37	6L6...	.78	12BE6...	.46
1L4...	.51	6AX4GT...	.60	6Q7...	.40	12BH7...	.61
1L6...	.51	6AX5GT...	.60	6S8GT...	.65	12BY7...	.65
1LC6...	.49	6BA6...	.58	6SA7...	.45	12BZ7...	.63
1N5GT...	.51	6BA7...	.58	6SK7GT...	.45	12SL7GT...	.60
1R5...	.51	6BC5...	.48	6SL7GT...	.60	12SN7GT...	.56
1T5...	.51	6BF5...	.48	6SQ7...	.40	19T8...	.71
1X2...	.65	6BG6G...	1.18	6T8...	.71	25BQ6GT...	.82
2A3...	.35	6BH6...	.51	6U8...	.76	25CU6...	1.09
2A7...	.35	6BJ6...	.51	6V3...	.80	25L6GT...	.41
3Q4...	.53	6BK5...	.75	6V6GT...	.48	25Z5...	.55
3Q5GT...	.61	6BK7...	.78	6W6GT...	.53	25Z6GT...	.36
3S4...	.48	6BN6...	.90	6X4...	.37	35B5...	.48
3V4...	.48	6BL7GT...	.78	6X5GT...	.38	35C5...	.48
5V4G...	.49	6BQ7...	.85	6XB...	.80	35W4...	.33
5Y3GT...	.30	6BY5G...	.60	7F8...	.49	35Y4...	.35
5Y4G...	.40	6BZ7...	.95	7N7...	.52	35Z5GT...	.33
6A8...	.40	6C4...	.41	12AL5...	.43	50A5...	.48
6AC7...	.65	6CB6...	.51	12AT6...	.37	50B5...	.48
6AF4...	1.02	6CU6...	.95	12AU6...	.43	50C5...	.48
6AH4GT...	.65	6F6...	.42	12AV7...	.73	117L7GT...	1.20
6AK5...	.96	6F5GT...	.44	12AX4GT...	.60	117Z3...	.33
6AL5...	.43	6H6...	.50	12AX7...	.61	117Z6GT...	.65
6AQ5...	.48	6J5GT...	.49	12AZ7...	.65	80...	.40
6AR5...	.48	6J6...	.61	12BA...	.72	1629...	.39
6AU5GT...	.60	6K6GT...	.39	12BA6...	.46		

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1U4...	.38	6W4GT...	.38
1U5...	.38	12AT7...	.65
5U4G...	.39	12AU7...	.49
6AG5...	.48	12SA7...	.39
6AU6...	.37	12SK7...	.39
6BE6...	.39	12SQ6GT...	.35
6BQ6GT...	.74	12S6GT...	.38
6CD6G...	.74	50L6GT...	.45
654...	.38		

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6550

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the necessary substitution information for all electromagnetically deflected types, irrespective of make, including the "Mirror-Back" (aluminized) types. In easy-to-find, easy-to-read fashion, it indicates directly interchangeable types as well as substitutes requiring a minimum of service changes.

A handy index lists all picture tube types and places each in its correct substitution group. Then by a tabulation of characteristics within each group, the best choice of an individual substitute type is made easy to find.

Service dealers may obtain a copy from their CBS-Hytron distributors without charge.

ELECTRICAL TAPES

A new four-page brochure entitled "Permacel 2 in 1 Electrical Tapes" is now available from the Permacel Tape Corporation of New Brunswick, N. J.

The publication discusses the advantages of using the company's tapes and supplies a complete table of technical data, illustrating the curing cycle, tensile strength, and seven other pertinent factors relating to the backing of these tapes which are composed of various materials ranging from glass cloth to crepe paper.

A copy of this brochure is available from the Advertising Services Department of the company.

ELECTRONIC PROJECTS

Henry Francis Parks, 104 S. E. 57th Ave., Portland 15, Ore., is offering copies of Catalogue No. 3 which lists some 44 projects which are currently available to the electronically-minded experimenter.

There are twenty-one categories covering timers, intercoms, relays, counters, broadcast-radio, power supplies, wired-radio broadcasting equipment, musical instruments, receivers, amplifiers, model controls, remote controls, transceivers, etc., to mention a few in the electronic field.

The company offers the requisite circuit diagrams to build this various apparatus and, in the case of special parts, offers the components as well.

The catalogue is available without charge upon written request.

STANCOR FLYBACKS

Chicago Standard Transformer Corporation, Addison and Elston, Chicago 18, Ill., has released a comprehensive data sheet describing and illustrating the six new Stancor exact replacement flyback transformers which have been designed for General Electric receivers.

Detailed information on the models using these units is given in this publication, which has been designated as the Stancor Bulletin 504. It is available from distributors or from the company direct.

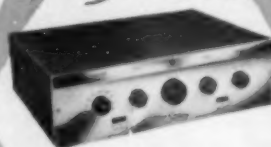
"BRANDED FOR LIFE"

C & H Supply Company, 415 E. Beach Ave., Inglewood, Calif., is now distributing copies of its colorful brochure, "Branded for Life".

The book explains in detail how its "Metal-Cals", an anodized, etched

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- * Pioneer Type E-3, input 5.6 volts @ 22 amps, output 400 volts @ 175 mill. \$14.95
- * Gothard Type SP-20, input 5.6 volts @ 22 amps, output 400 volts @ 200 mill (less endbell). \$14.95
- * Gothard Type SP-17, input 5.6 volts @ 22 amps, output 400 volts @ 175 mill. With endbells. \$14.95
- * Less endbells \$11.95

These motors are in excellent used condition.

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- * HS-23 high impedance, BRAND NEW with ear pads \$4.45
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- * CD-307A Cords, 6 ft. 1.10



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RADIO & TELEVISION NEWS

aluminum nameplate, can be used for quick, economical trademarking, serial numbering, service labeling, etc. In addition to telling what the units are and how they may be ordered, the new booklet contains a montage layout of typical units, representing industries and products from every part of the country.

CAPACITOR DATA

Gudeman Company, 340 W. Huron St., Chicago 10, Ill., now has available a new 6-page, 2-color bulletin illustrating and giving complete technical information on its miniature flat "Mylar" dielectric capacitors.

Bulletin No. 337-8 includes tables of capacitance values and voltage ratings, dimensional drawings, an explanation of catalogue numbers, data on voltage derating for high temperature operation, dielectric material, and seals, capacitance change, lead specifications, test voltage, life test, power factor, insulation resistance, moisture resistance test, etc.

Copies of this publication are available without charge on request.

TV TRANSMISSION LINE

Prodelin Inc., of Kearny, N. J., is now offering copies of its Catalogue No. 415 entitled "Transmission Line for VHF and UHF Television".

The catalogue lists briefly the types of line available, and then presents transmission line efficiency graphs on the various lines. The material is listed in the most concise form possible for maximum utility.

ASA STANDARDS LISTING

The American Standards Association, 70 East 45th St., New York 17, N. Y., has published a 48-page index which lists some 1500 currently available standards.

There are 210 standards for construction and civil engineering, 153 mechanical, 272 electrical, 158 safety, 165 textile and wearing apparel, 251 photography and motion pictures, 74 petroleum products, 69 chemical, 62 metallurgy, 38 gas-burning appliances, 32 drawings, 10 office equipment and supplies, and a miscellany of others.

This list is available without charge from the Association.

VIBRATOR REPLACEMENTS

Vokar Corporation of Dexter, Mich., has just issued a comprehensive cross reference and replacement guide, No. 108.

The publication is divided into three sections covering the radio or car make and model with the Vokar vibrator part number, the original equipment part numbers with the company's cross reference, and a cross index of Vokar and other vibrator manufacturers' part numbers.

The material is presented in tabular form for quick reference.

PICTURE TUBE GUIDE

General Electric Company's Tube Department, 1 River Road, Schenectady 5, N. Y., has announced the availability, 1955



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The smartly styled receiver with the 10, 11, 15, 20, 40 and 80 meter amateur bands and separate bandspread tuning condenser. Has crystal filter, antenna trimmer, "S" Meter, RF stage and two IF stages. Seven tubes plus rectifier. Band selector, sensitivity, main tuning, standby, noise limiter controls and others. Broadcast band: 540-1600 Kc. Three short wave bands: 1600 Kc - 34 Mc. Chrome-trimmed, gray-black steel cabinet. Ship. wt.: 36 lbs.

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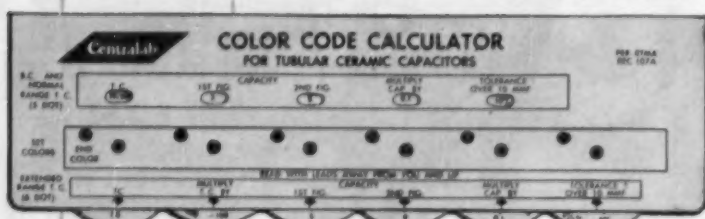
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Quick way to read the color code on any ceramic capacitor or resistor!

Use this handy Centralab Color Code Calculator

Match the colors on this calculator with the colors on any ceramic capacitor or resistor coded in accordance with JAN or RETMA requirements. When you do, the information you're looking for shows up on the face of the calculator. There's temperature coefficient, capacity, and tolerance.

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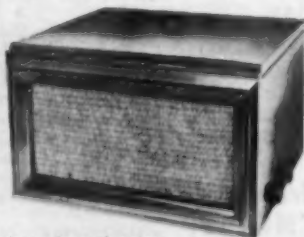
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PRINTED CIRCUIT DIVISION

TECHNIQUES INC.
130 BELMONT STREET • ENGLEWOOD, N. J.

ability of a new edition of its "Quick Selection Guide for Television Picture Tubes", publication (ETD-1001A).

The purpose of this new booklet is to help designers select a particular tube from the large number of types now on the market. It lists 205 tube types and for each of these the following information is listed: whether it is aluminized or not, external conductive coating capacitance, type of ion-trap magnet, face, dimensions, and style of anode terminal.

DAVOHM RESISTOR

The Daven Electronic Sales Corp., 191 Central Ave., Newark 4, N. J., is currently offering a new six-page brochure describing in detail its recently announced "Davohm" Series 850 resistor.

The new unit is a metal film type which combines predictable accuracy with low cost and production availability. The brochure gives full performance details on the 1/4-, 1-, and 2-watt sizes. It is available only on letterhead request.

CATALOGUE SUPPLEMENT

Newark Electric Company, 223 W. Madison St., Chicago 6, Ill., has issued copies of its Supplement No. 60 covering the latest releases for industry, radio, TV, and high-fidelity applications.

This compact 48-page booklet illustrates and describes a wide variety of equipment and component parts. The material is completely indexed for ready reference.

Copies are available without charge upon written request to the company.

TELEX DATA

Telex, Inc., Telex Park, St. Paul 1, Minn., is now offering two new catalogue sheets describing the advantages and applications of its miniature jack and plug combination and its new dynamic earphone.

The jack and plug combination, one-third the size of previous models, is designed to be used in computers, dictating machines, tape recorders, and miniature radios. The literature illustrates and describes these applications and provides complete specifications. The two-color catalogue sheet on the earphone shows how the unit is worn and lists its uses from stenography to aviation.

Either or both of the data sheets are available on request from Dept. KP of the company at 1633 Eustis St.

INTERCHANGEABILITY GUIDE

A new "quick answer" disc-type phonograph cartridge interchangeability guide is now being offered free to technicians and service dealers by Electro-Voice, Inc., of Buchanan, Mich.

A turn of the wheel shows at a glance the correct E-V model to replace any popular crystal or ceramic phono cartridge. Effective use of contrasting colors makes the up-to-date information easy to read. A specification table shows the tracking force, frequency response, voltage output, ap-

plication rpm, needle number, and list price of the E-V cartridges.

The guide is only 6½" in diameter and is easy to carry on service calls either in the service coat pocket or in the tool and tube caddy.

TRANSISTOR BOOKLET

A new booklet, written especially for hams, has just been published by the Electronics Division of Hydro-Aire, Inc.

Entitled "The Transistor and You," the booklet will be distributed without charge through electronic jobbers that carry the firm's CQ-1 low-cost junction units designed for amateur applications.

The booklet contains instructions and circuit diagrams for a three-stage transistorized regenerative radio receiver, low-cost broadcast receiver, dynamic microphone preamp, radiophone monitor, electronic timer, relay control circuit, electronic time generator, audio oscillator, and field strength meter.

In addition to jobbers, the book is available from the company at 3000 Winona Ave., Burbank, Calif. —50—

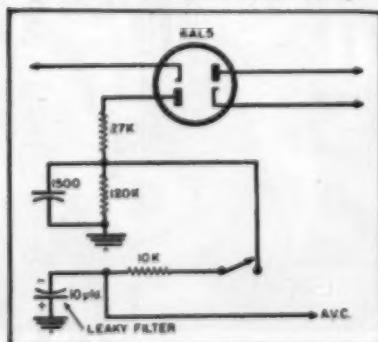
When to Pull a Chassis

(Continued from page 51)

There was a certain 10 µfd. filter capacitor to ground in the a.v.c. leg. This filter sometimes develops a high leakage. In any other application there would be no difficulty. But in this spot, it harms the sensitive a.v.c. voltage. (See Fig. 3.) This, in turn, does not allow the video amplifier input to hold at a "must" level of six volts peak-to-peak. That was the repair. The filter was replaced with one of less leakage, and the picture cleaned right up.

The whole idea of our TV service business is to fix TV sets satisfactorily, make the set owners happy, and enjoy a profit for our efforts. If a defective part is easily located and replaced, these TV service requirements can be met right in the home. However, if you run into hornet's nest wiring or perplexing troubleshooting, the only sure way to do your job is to pull the chassis into the shop. —50—

Fig. 3. An overloaded picture resulted from the leaky a.v.c. filter capacitor shown here. This was fixed in the shop.



June, 1955

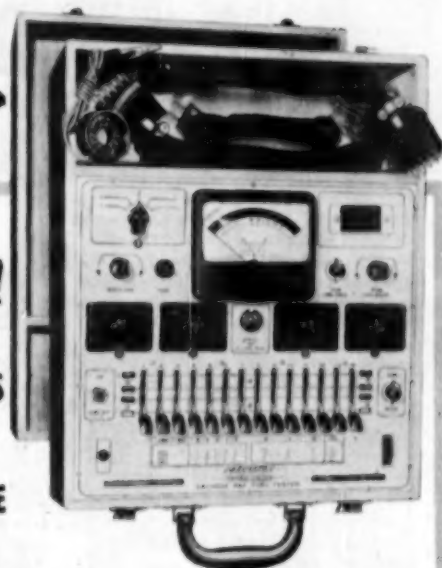
Don't Pull that Chassis...

unless you know

IT'S THE CHASSIS
and NOT

THE PICTURE TUBE

That's At Fault!



The PRECISION CR-30 cathode-ray tube checker is specifically designed to provide a fast, reliable test of the picture tube — the most expensive single component in a TV set!

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(and not total cathode emission)
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Receiving-tube checkers were made for testing receiving tubes, and NO CABLE ADAPTER will enable them to do the job of the CR-30.

Cable adapters only check for filament continuity, a degree of inter-element short, and a so-called emission test. For these limited applications, PRECISION offers a ruggedly-constructed adapter cable, Model PTA., Net Price \$6.75, complete; for use with all present PRECISION tube testers.

You can't afford to guess when you test the most expensive component of a TV set. Be sure — with the PRECISION CR-30.

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this performance!

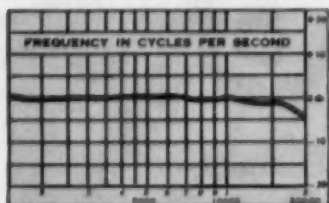


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DIAMOND
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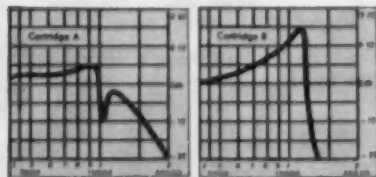
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FAIRCHILD 220



CARTRIDGE A CARTRIDGE B

**And, a
perfect mate...**



**280 Series
Transcription
Arm**

Match your cartridge to the finest arm! Low-mass and resonance-free, Fairchild's 280 Transcription Arm allows the cartridge alone to lift all the tone color from your recordings. Superb precision balance and engineering assure perfect mid-groove tracking, always. And, any standard cartridge plugs in easily—performs better—with this versatile Fairchild 280!

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FAIRCHILD RECORDING EQUIPMENT

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DENVER DX CONTEST WINNERS

*Hams receive their awards
at gala banquet sponsored
by RAPSCO in Denver, Colo.*

RADIO Products Sales Company was host at a gala banquet held recently in Denver to honor the winners of its first annual DX contest.

Hams within a radius of 250 miles of Denver were eligible to compete with judging based on QSL cards earned during the months of September, October, and November of last year.

The top award went to Ed Wier, W0OEV of Denver who contacted over 67 countries and earned 208 confirmations during the contest period. W. A. Wessel of Denver was second; R. V. Rosellini was third; T. D. Littlejohn was fourth, while Earl Cochran of Colorado Springs was fifth.

The first prize was "winner's choice" of a top ham receiver while the other prizes included ham gear donated by Harvey-Wells, Gonset, Thordarson-Meissner, Sonar, Wen, and Bliley. RAPSCO donated the award for the top prize.

The company plans to sponsor the contest annually to stimulate interest in amateur radio.

—50—

Claude Maer, Rocky Mountain ARRL director; Walter E. Nettles, owner of Denver's Radio Products Sales Co.; Bill Clyne, FCC engineer-in-charge, Denver; and first-prize winner, Ed Wier, at the award dinner held at Denver's Park Lane Hotel.



Ed Wier, W0OEV, of Denver was named winner with 208 confirmed contacts in 67 countries. He selected a Hallicrafters SX88 as prize.



Glenn Brocker of RAPSCO presents second-place winner, Pete Wessel, W0JYW, his Gonset "Bantam Beam" during the award dinner.



R. V. Rosellini, W0SYA, beams his pleasure over his Harvey-Wells "Bandmaster V.F.O." third prize in the Denver DX-ing contest.



RADIO & TELEVISION NEWS

Certified Record Revue
(Continued from page 60)

techniques. It has gained much from this and now, in addition to being the best performance, is quite satisfying sonically. String tone is cleaner, less edgy, the brasses have more bite and percussion is better defined. "Iberia" is a newer recording but is still no youngster. This recording gained some notoriety as Toscanini was not satisfied with it and refused to OK it for quite a period. Evidently his objections have been overcome and the flaw rectified. Not the best sound in the world, it has generally clean strings, rather thick textured brass and woodwinds, fair percussion. The performance is good—a rather subdued one for a Toscanini. His tempi are slower than most and in his striving for contrast the work loses a little of its spontaneity.

A fine disc for the beginning hi-fi fan or for those who want the ultimate in performance of "La Mer". Curve was OK, as were surfaces.

HANDEL

THE WATER MUSIC (COMPLETE)
Boyd Neel Orchestra conducted by Boyd Neel. London LL1128. RIAA curve. Price \$3.98.

Hard on the heels of the excellent version by Hewitt on the *Haydn Society* label comes this complete version of the "Water Music" by that old master of Handel, Boyd Neel. The Hewitt was a good recording and an excellent performance and it is a shame it must be superseded so quickly. However, there is no denying the authority of Boyd Neel. His performance is as deft and knowledgeable here as his justly celebrated readings of Handel's "Concerto Grossi". His tempi, his handling of orchestral textures, and above all the classic grace with which he imbues the work, make this the preferred version. The orchestra is also better than the Hewitt group. String tone is better, as is the phrasing. The horn players are much superior with big solid tones. Last, but not least, this is smoother, richer, more wide-range sound, with better balance and superior acoustics. Sounds like a triumph, right down the line, doesn't it? Well, it is, but if you have acquired the *Haydn Society* disc you need not feel too badly. That is still an estimable recording.

If you are going to add this work to your library, this disc will probably stand the test of time better than any other version. No curve adjustment was needed. Moderately quiet surfaces.

STRAVINSKY

L'HISTOIRE DU SOLDAT
OCTET FOR WIND INSTRUMENTS
SYMPHONY OF WIND INSTRUMENTS

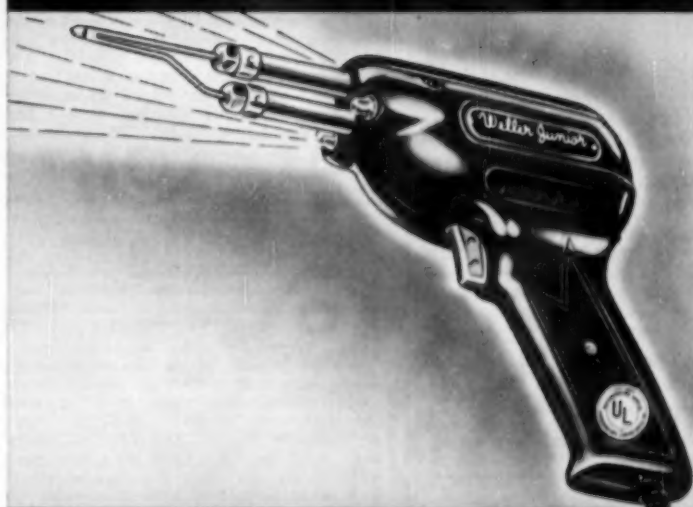
North West German Radio Orchestra conducted by Igor Stravinsky. Columbia 5M14964. NARTB (old) curve. Price \$5.95.

Now that "L'Histoire" has been recorded almost half a dozen times, the master himself takes a crack at the score. Like many Stravinsky-conducted performances of his own works, this isn't what it might seem to be. One can hardly question the authority of interpretation, yet for some reason other people seem to do a better job! Or at least the score sounds more "listenable" in the hands of other conductors. I can't pinpoint for you why this should be so, except in isolated instances. The tempi which Stravinsky employs in this work seem too fast as compared to other readings. The work seems to lose cohesion and gives the impres-

June, 1955

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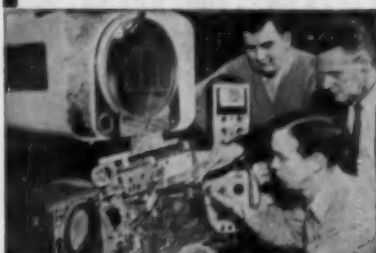
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sion of being disjointed. However, this is
only my opinion and you may like the work
in its authentic garb.

Paradoxically, the "Octet for Wind In-
struments" is infinitely better sounding here
than in any previous version. Here Stravin-
sky's sense of rhythm gives the score new
zest and life. The "Symphony" is a rarity
and gets its premiere performance on LP.
Made some time ago with Stravinsky con-
ducting the Northwest German Radio Or-
chestra, it employs a very large wind section
(26 men) and is an amazing study in wind
sonorities.

Soundwise the disc is variable. The
"L'Histoire" is given a good clean recording
with fine string tone which does not lack
bite in the proper sections and with bright
brass and rich sounding clarinet. The per-
cussion lacks strength and generally the
work is not as good sounding as the recent
Vanguard effort. The "Octet" fares better
and is quite clean and articulate. The
"Symphony" was made in 1951 in Germany
— a fact which is not difficult to discern.
A few db bass boost helped the NARTB curve.
Good surfaces.

SAINT SAENS PIANO CONCERTO #2 PIANO CONCERTO #5

Pro Musica Symphony, Vienna, con-
ducted by Hans Swarowsky with Orazio
Frugoni, pianist. Vox PL8410. NARTB
(old) curve. Price \$5.95.

A good bargain record here with two of
Saint Saens most interesting piano concerti
as the attractions. Frugoni is an excellent
technician and the difficulties of the scores
are taken with ease. His tone is slightly
hard and if this artist could get a little more
warmth into his interpretations, he would
be a talent to contend with. Soundwise the
disc is about the best available of these
works. Generally good piano tone, on the
glassy side at times, good brass and string
tone in the orchestral accompaniment. If
you like rich sounding big-boned concerti in
the grand romantic manner you will enjoy
these. No curve adjustment was necessary
and surfaces were quiet.

KODALY PSALMUS HUGARICUS London Philharmonic Choir and Orches- tra conducted by Georg Solti. THE PEACOCK (VARIATIONS) London Philharmonic Orchestra con- ducted by Georg Solti. London LL1020. RIAA curve. Price \$3.98.

This is the second version of the "Psalmus
Hugarius" on LP and is superior in every
aspect to the *Urania* recording. If you are
not familiar with this work and you like
choral music, I urge you to listen—this is a
very thrilling large scale work. Kodaly has
a particular facility for writing highly dra-
matic, very "listenable" modern choral works
as anyone who has heard his "Te Deum" or
"Missa Brevis in Tempore Belli" can
testify. The score is heard in English on
this disc and while this makes for intelli-
gence, it plays havoc with some of the
choral textures.

Conductor Solti, who is making quite a
name for himself in the *London* catalogue,
is in his element here. He knows the idiom
and he makes the most of it. His tempi are
metronomically perfect, his balance is sensi-
ble and his dynamic phrasing is expressive
without being overblown. I give you fair
warning, the score is fairly quiet in the
opening measures, but soon the work asserts
itself with a gigantic outpouring of choral
sound. The dynamic range is quite astound-
ing. Soundwise this features superb choral
articulation, clean strings, nice crisp brass
and woodwinds and an excellent choral/
orchestral balance is maintained.

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Only the 5 Top-Quality Brands Shipped

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Order Blank.

- Lists ALL Popular TV & Radio Types.
- Heavy Mail-Order a Pleasure.
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8K72 .. .90	3047L .. 1.00	6E78 .. 1.15
2K30 .. 1.95	Surplus 5.75	5667 .. 2.95
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3B24 .. 2.00	417A-Kly	5692 .. 4.95
3B24 .. 2.00	417A-Kly	5693 .. 4.95
3B24 .. 2.00	417A-Kly	5694 .. 4.95
3B24 .. 2.00	417A-Kly	5695 .. 4.95
3B24 .. 2.00	417A-Kly	5696 .. 4.95
3B24 .. 2.00	417A-Kly	5697 .. 4.95
3B24 .. 2.00	417A-Kly	5698 .. 4.95
3B24 .. 2.00	417A-Kly	5699 .. 4.95
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RADIO & TELEVISION NEWS

The "Peacock Variations" has been recorded previously by Antal Dorati and the Minneapolis Symphony and I find I prefer that reading to this effort. Solti's reading is highly competent—a nicely paced, well integrated job. However, he does not have the insight into the score that Dorati has and he tends to oversentimentalize. Good smooth sound here, but not on a par with the sharply focussed robust sound on the Dorati disc. All in all, this is a disc worth your attention. Curve was OK and surfaces were quiet.

RIEGGER

SYMPHONY #3
Eastman Rochester Symphony Orchestra
conducted by Howard Hanson.

MENNIN

SYMPHONY #3
New York Philharmonic conducted by
Dimitri Mitropoulos. Columbia 4ML4902.
NARTB (old) curve. Price \$4.98.

If you are a lover of modern music you will find this disc particularly rewarding. Two of America's better composers give us their third symphonies, and furnish some interesting contrasts. Riegger's work is unabashedly atonal and is, I think, one of the best examples of this type of writing to come from our country. Richly scored, the best passages occur in the tremendous pas-sacaglia and fugue with which the symphony concludes. Mennin's work is more conventional, but is nonetheless interesting. His use of strings is sure-handed and logical and is a far cry from the tactics of most of his contemporaries. Like most modern works, these lend themselves very well to hi-fi sound and Columbia has done one of its best jobs in capturing the excitement of brass and percussion. Both are quite wide range and have good dynamics. Acoustics could have been improved—a little on the dry side and somewhat cramped. The NARTB curve did not need adjustment.

RACHMANINOFF

PIANO CONCERTO #2
St. Louis Symphony Orchestra conducted
by Vladimir Goltschmann with Leonard
Pennario, pianist. Capitol PB302. RIAA
curve. Price \$4.98.

This is the 13th version of this work on LP and one of the best. Young Leonard Pennario does his usual competent job here, but indulges in a few mannerisms and some tempo-tampering that keeps it out of the definitive bracket. However, I will say this, not since the old Rubenstein reading has anyone captured the essentially lyric and romantic qualities of the work as well as Mr. Pennario. Soundwise this is about the most hi-fi available. The piano is clean and sharply defined, if a little hard-toned at times. The strings are quite smooth, the brass is particularly sonorous and woodwind sound is very "live". The poor acoustics which have marred other recordings of the St. Louis group are not in evidence here. A nicely balanced sound prevails throughout. A good recording for fledgling hi-fanatics or those who want to modernize their libraries. Curve did not need adjustment. Very quiet surfaces.

SIBELIUS

SYMPHONY #2
NBC Symphony Orchestra conducted by
Leopold Stokowski. Victor LM1854.
RIAA curve. Price \$3.98.

Sibelius recordings will be coming thick and fast throughout this year as tribute is paid him on the occasion of his 90th birthday. This is the 10th version of his most popular symphony to appear, and as far as I am concerned, they can stop right here. Boy, this has everything. Stokowski's performance is many times at variance with

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"Requiem" has some good tympani sound in the opening passages along with excellent string tone and some stirring brass sound. If your musical appetites are somewhat jaded, this disc might be just the thing. Try it!

ANTHEIL BALLET MECHANIQUE BRANT

**SIGNS AND ALARMS
GALAXY 2000
Columbia 4ML4956. NARTB (old)
curve. Price \$4.98.**

Well, boys, they don't come much wilder than this! Positively the dawgondest collection of noise ever recorded. Why, compared to this, Varese's "Ionization" is almost baroque. The "Ballet Mechanique" was the *avant garde* work of the early twenties and caused as much of a riot as "Le Sacre" at its premiere performance. It is not hard to realize that the work was probably written with tongue in cheek, for hearing it now impresses one only with its posturing. There will probably be many who like this for its hi-fi content. I freely admit that in addition to liking music I have a predilection for exciting hi-fi sound. But I am not so "wild-eyed" that I can enjoy listening to noise at the expense of music. No matter how open-mindedly I approach this score, I can't see it. As for sound, you have snare drums, tympani, bass drum, tam-tam, cymbals, etc., etc., even the employment of the sound of an airplane propeller. As far as it goes, 'tis good recording. Transients are generally clean and dynamics are quite wide. The works on the flip side are sonic trifles that sound like background music for B-grade space movies. But don't let me frighten you away—could be you might like this sort of thing. It's your ears and your nerves—so go ahead! Give this platter a whirl!

WALTON PORTSMOUTH POINT OVERTURE SIESTA SCAPINO WISE VIRGINS BALLET (BACH)

London Philharmonic Orchestra conducted by Sir Adrian Boult. London LL1165. RIAA curve. Price \$3.98.

This is a perfectly wonderful disc. The music is interesting, the sound is among the best London has ever recorded, and the playing of the orchestra and conducting is of a very high order. You can practically smell the sea and see the sailormen dancing the hornpipe in the "Portsmouth Point." The score is not consciously programmatic, but Walton has nonetheless drawn us a pretty vivid and graphic picture of a bustling waterfront. The music is very gay and spritely and should appeal to most hi-fi fans.

The other works are interesting, each in its own way, and the "Wise Virgins" here receives the best sound and best performance on records. Once again this is "big hall" sound, and one of the most successful of this breed extant. The brass is formidable in its clarity and weight, the high strings clean and sweet and the cello and contrabass ultra-sonorous. Superb woodwind intonation in the "Wise Virgins." Great, robust percussion, especially the bass drum in the "Portsmouth Point." Sir Adrian keeps all his forces on their toes and elicits some fabulous playing from his men, especially the brass players. Very low distortion throughout the disc and dynamics which are startling. It is not hard to predict that this disc will become a highly regarded demonstration record. Curve was better with a slight bass boost and surfaces of my copy were quiet.

No tape reviews this month, but a new batch is due to arrive soon and this feature will then be resumed.

-50-

June, 1955

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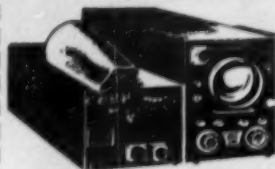
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RADIO-TV Service Industry News

**AS REPORTED BY THE
TELEVISION TECHNICIANS LECTURE BUREAU**

FOR those who are taking the time to review developments in all activities at the consumer level, one thing stands out crystal clear—we are in the midst of a shifting, changing retail economy that will have a marked influence on the future of all businesses that serve the public directly. This, of course, will include the business of servicing television, radios, and other electronic equipment in the home.

When you start a business, you immediately become a part of a vast economic machine that can either propel you into the situation known as a "successful business operation," or it can grind you into nothingness as just another figure in the statistics of business failures. There are some elements in the operation of your business that you control; there are other elements that are completely outside of your control. Your success or failure will be determined by your ability to properly handle the elements that are under your control and your sagacity in guiding your business with the changing economic pattern. The one requires a good knowledge of the best management practices in your type of business, and the other requires frequent objective, realistic appraisals of the changing business scene.

Fair Trading

Harry B. Price, Jr., dynamic president of NARDA (National Appliance and Radio Dealers Association), passed along some sound advice to radio-appliance dealers in a recent talk in San Francisco. "The war is on," he said. "At the manufacturers' level it is to be competitive or die. At the distributors' level, it's justify your existence or close up. And at the dealer level we must recognize the change and adjust to it."

"I do not think there is any substitute for integrity in any business," he continued. "You must operate at an established retail price. All customers, regardless of race, creed, color, or privilege, should pay the same price in your store. The doing away with list prices isn't shocking. Retailers who have been selling below list did away with list prices a long time ago. We must all understand this—neither you, your distributor, nor your manufac-

turer establishes the ultimate selling price of our products. The public determines the price it will pay. Decide how you will adapt yourself to a changing market. There never will be a substitute for integrity, value, or service, but if someone develops a more economical way to deliver all three—watch out! It is a human shortcoming to resist change. However, failure to recognize sound progress can relegate one to failure."

Dealers who have been deeply concerned about the growing competition from discount houses will now have to face up to the realities of a changing pattern of distribution. The recommendation by the U. S. Attorney General's committee that all fair trade legislation should be scrapped may spur the repeal of the laws that have made fair trade price fixing legal.

These developments are of special significance to the service industry because radio-appliance dealers who have been most successful in combatting the discount houses in their areas have constantly stressed the fact that consistently good service on the products they sell has been a vital factor in successfully meeting the competition of the "low price-no service" outlets. We are knocking on the door of a new era of tremendous expansion in the electronics industry—the era of color television. It would not be surprising if the engineering ingenuity that has sparked so many phenomenal developments in the electronics industry will find a solution to the cost factor in the production of color TV and so get color television rolling before the end of this year. Most certainly, a great deal of engineering research is at work on this problem of color television cost with an eye on the national political conventions and subsequent presidential campaigns that will be underway within a year. The set manufacturing industry will throw all of its resources into the production and sale of color TV sets to take full advantage of the natural sales opportunity this quadrennial political campaign will provide.

Competent, efficient service will be a prime factor in the sale of color TV sets at all times. Who will handle the bulk of this service will depend on the people who buy the sets.

Buyer preference for service on a product normally is for the dealer from whom the product is purchased. This is natural, of course, for the purchaser has initially shown his confidence in the dealer by buying the merchandise from him. He feels that the dealer's organization will take a special interest in the device since they sold it and that they know best how to keep it in good operating condition because of their close association with the company that made it.

In the event that the retailer does not have a service department, the average buyer's preference for service is either for "factory authorized" or "factory supervised" service. Where direct factory service is available, a high percentage of consumers will select that type of service rather than any other.

This factor of buyer preference will probably force every major producer of color television sets into the service business in most major areas. The service contract will probably come back into the picture again and thousands of people who were hurt in the failure of large independent service companies will refuse to buy contracts unless they are backed by the manufacturer of the set.

Outside the major centers, forward-looking television-appliance retailers will institute their own service departments because of the competitive advantage it will give them over the non-servicing dealers and the multiple-product merchandisers.

Independent Service

In numerous areas there are independent service companies that have handled installations and service for retailers successfully for so many years that they will move into the color television servicing field as a normal expansion of their clients' activities. Numerically, these service companies represent only a very small segment of the independent service industry, so their operations are in no way typical of the independent service companies that are now operating self-developed c.o.d. businesses. It is this latter segment of the servicing industry that will be most affected by a major shift of service to manufacturer-controlled or dealer-controlled television service. Any decided shift of this kind would not only affect color television servicing; it would also bring about a shift in who handles monochrome TV servicing.

Previously, it was pointed out that the controlling factor in who will handle the bulk of color television service will be the general public—the people who buy the sets. One of the trends in mass preference that has been accelerating during the past few years has been that of patronizing big stores and big companies. On Fridays and Saturdays, when long lines of customers line up at check-out counters to pay for their heavily-laden pushcarts of groceries and sundries at the supermarkets, community independent grocers struggle to keep their busi-

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8Z4	.45	5R4GY	.78	6BZ7	.80	6Y6GT	.37	18V8	.70
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1C5GT	.43	5V4	.60	6C5	.36	7A5	.55	25B6GT	.80
1D3GP	.45	5X4G	.44	6C6B	.51	7A6	.67	25L6GT	.48
1H5GT	.40	5Y3GT	.32	6C6G	1.18	7A7	.45	25V5	.45
1J6GT	.40	5Y4G	.37	6D6	.50	7A8	.46	25Z5	.38
1L4	.43	5Z3	.42	6E5	.46	7B5	.41	25Z6GT	.38
1L6	.58	5Z4	.54	6F5GT	.39	7B7	.43	32L7GT	.60
1LA4	.50	5A7	.59	6F6	.40	7B8	.47	32A5	.48
1LA6	.40	5A8	.59	6G6G	.42	7C4	.40	35B5	.52
1LB4	.39	5AB4	.44	6M6GT	.40	7C5	.44	35C5	.51
1LC5	.51	5AC7	.70	6J4	2.00	7C6	.45	35L6GT	.48
1LD5	.58	5AF4	.80	6J5GT	.40	7F8	.70	35W4	.55
1LE3	.58	5AG5	.81	6J6	.49	7V4	.35	35Y4	.35
1LE3	.58	5AG7	.70	6J7	.45	12A6	.40	35Z3	.41
1LG5	.58	5AH6	.70	6J8G	.50	12A7E	.42	50L6GT	.45
1LH4	.60	5AJ5	.70	6K5GT	.39	12A7T	.68	45Z5GT	.40
1LN5	.40	5AK5	.55	6K7	.40	12A8	.43	50A5	.48
1NSGT	.51	5AL5	.60	6K6	.67	12A7	.55	50B5	.52
1V5GT	.58	5AQ5	.48	6L6A	.70	12A6V	.57	50C5	.51
1R1	.60	5AR5	.50	6L7	.52	12A7	.60	50L6GT	.45
1R3	.57	5AS6	1.75	6M7	.61	12A7K	.60	70L7GT	.60
1S4	.53	5AS7G	2.25	6Q7	.65	12A7	.65	75	.44
1S5	.52	6A7	.40	6R7	.49	12B6A	.48	77	.39
1T4	.50	5AUSGT	.60	6S4	.41	12B8	.70	78	.39
1T5GT	.58	5AUS	.43	6S7G	.47	12B8E	.50	80	.35
1U4	.49	5AV5GT	.75	6SA7GT	.48	12B8T	.61	83V	.60
1U5	.50	5A7	.40	6S7	.50	12B7	.58	117L7GT	1.10
1V	.43	5AX3GT	.59	6S7	.43	12BGT	.40	117N7GT	1.10
1X2A	.63	5B4G	.54	6M7	.45	12K8	.40	117P7GT	1.10
2A5	.50	5B6	.70	6S7GT	.45	12S4T	.46	117P7GT	1.10
2A7	.23	5B6	.40	6S7	.48	12S4T	.46	117P7GT	1.10
2B7	.80	6C5	.40	6S7GT	.57	12S4T	.46	117P7GT	1.10
2D21	1.00	6B6E	.50	6S7GT	.57	12S4T	.46	117P7GT	1.10
2V1G	.60	6B7F	.41	6S7GT	.43	12S4T	.46	117P7GT	1.10
2X2A	1.00	6B6G	1.18	6S7GT	.43	12S4T	.46	117P7GT	1.10
3A4	.53	6M6E	.51	6S7	.43	12S4T	.46	117P7GT	1.10
3B7	.54	6B16	.40	6T7G	.63	12S4T	.46	117P7GT	1.10
3D6	.45	6BK5	.70	6T8	.70	14A5	.50	80B1	1.50

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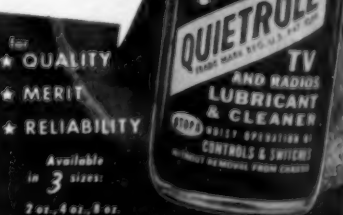
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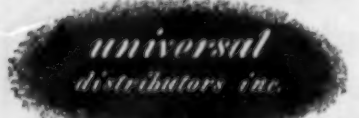
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nesses going. In many cases, the total saving at the supermarket is less than the cost of the transportation to get there, but families flock to them in preference to the nearby, small, independent grocers.

Of course, these immense supermarkets are show-places; they long ago outgrew the grocery, meats, and vegetables aspects of their business and now display and sell products that have been bread-and-butter items in drug and hardware stores and novelty shops. The average American consumer likes drama and excitement and is always on the prowl for something different. The supermarket is giving it to them. Time was when a goodly segment of the American public took a keen delight in looking for small shops where they could buy something different from the run-of-the-mill items handled by the large stores. These small shops with unusual products and services are still in existence—although gradually diminishing in numbers—as the public gradually bows to standardization of the things they wear, eat, and live with.

These are definitely trends in the living and buying habits of the public, and they affect independent servicing and retail businesses equally as much as the independent grocers and druggists. On the face of it, these trends seem to portray a rather gloomy picture for the future of the independent electronic service dealer. They appear to indicate that as an important business entity, independent servicing will follow the path of the independent grocers who have steadily lost ground to better organized and merchandising-minded competition.

However, there is no reason why independent service should permit other industry elements to trample it and take over the work it has done so well. To hold its ground, the first thing the service industry must acknowledge and accept is that the "rugged individualist" no longer has the place he once had in the economic pattern of our country. This is the age of cooperation among men working in a common cause. It is an age when competitors must learn to work together for their common good and pool their resources to provide the force behind their activities that will offset the power and effectiveness of big competition.

The second thing independent service must acknowledge and accept is that it must assume the responsibility for financing its bids for acceptance and power. No other element of the industry is going to hand independent service a wad of dough and say "Here's the money to sell your know-how and facilities to the American public." If that job is accomplished it must be financed primarily by the concerns that make up the legitimate, independent service industry.

The third important factor that independent service must accept is that threats will not deter competition from either dealers, distributors, or set manufacturers. The paramount factor

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It is a well-known fact that no other type of organization can handle electronic service as efficiently and effectively as a well-managed, competently-staffed, independent service company. Such a company is geared to the business and consumer individualities in the area where it operates. Management is direct and positive. It is able to shift promotional emphasis swiftly from product to product as the occasion demands. It is always a profitable venture for the owner-manager and a dependable place of employment for its regular staff of employees.

There are literally thousands of independent service shops of various sizes whose owners now have the know-how and experience to expand their facilities and organizations to take care of the increased service load that color television will bring. This is a truism about locally owned and managed independent service companies that must be sold to the public on a national scale. The selling job that is necessary is much too big and expensive for a single company or even a strong local or state association to do for itself. It can be accomplished by the combined efforts of the majority of the full-time service businesses in all sections of the country who will benefit from the public acceptance that a well-designed and ingeniously promoted national campaign would bring about.

As an example of what national cooperation can do for independent dealers and retailers, take a look at the strength and dominance of the independent hardware dealers in their field. Their segment of retailing has been least affected by the trend toward mass distribution through chain stores and super retailing outlets.

The independent hardware dealers have been able to hold their position because of the strength, power, and dynamic nature of their national association—The Independent Hardware Dealers Association. This organization is able to match and even excel the promotional power of big combines. One graphic illustration is the two-page ad in color that the IHDA ran in *Life* magazine recently to support the local promotions of its members in every section of the country.

Another example of cooperative action among competitors to increase the efficiency of their individual businesses and reduce some of their operating costs is a plan for centralized warehousing and one-service delivery now being considered by members of the National Retail Dry Goods Association. Under this plan, area merchants would give up their individual bulk warehouses and substitute central warehousing for all area members. They would also abandon their individual delivery operations and handle this function through a centralized delivery agency.

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1A4P	.58	1U648	6AG899	6F899	6W648	12L764	4343
1A5GT	.40	2A390	6AG638	6J838	6X670	12M764	4343
1A7GT	.48	2A4	.....	.90	6AG7	.....	.38	6J8	.....	.38	6X6	.....	.70	12N7	.....	.64	43	.....	.43
1A8S	.38	2A5	.....	.90	6AG8	.....	.38	6J8	.....	.38	6X6	.....	.70	12P7	.....	.64	43	.....	.43
1B3GT	.67	2A7	.....	.90	6AG5	.....	.62	6J7	.....	.62	6X6	.....	.70	12Q7	.....	.64	43	.....	.43
1C5GT	.40	2B7	.....	.62	6AG6	.....	.38	6J8	.....	.38	6X6	.....	.70	12R7	.....	.64	43	.....	.43
1C7G	.40	2K3	.....	.38	6AG7	.....	.38	6J8	.....	.38	6X6	.....	.70	12S7	.....	.64	43	.....	.43
1D7GT	.78	2E2A	.....	1.14	6AG8	.....	.38	6J8	.....	.38	6X6	.....	.70	12T7	.....	.64	43	.....	.43
1E7GT	.35	3A4	.....	.44	6AK4GT	.....	.57	6L6G	.....	.57	6L6G	.....	.57	12U7	.....	.64	43	.....	.43
1F7GT	.40	3A5	.....	.40	6B7	.....	.90	6L6G	.....	.57	6L6G	.....	.57	12V7	.....	.64	43	.....	.43
1P5G	.44	3AGT	.....	.59	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12W7	.....	.64	43	.....	.43
1R4G	.48	3B4	.....	.59	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12X7	.....	.64	43	.....	.43
1R5GT	.48	3B5	.....	.59	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Y7	.....	.64	43	.....	.43
1R6G	.59	3F4	.....	.71	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4	.61	3G5GT	.....	.65	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4G	.58	3V4	.....	.65	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4A	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4B	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4C	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4D	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4E	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4F	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4G	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4H	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4I	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4J	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4K	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4L	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4M	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4N	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4O	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4P	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4Q	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4R	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4S	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4T	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4U	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4V	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4W	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4X	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4Y	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L4Z	.78	3V4	.....	1.25	6B8G	.....	.39	6N7	.....	.98	12AV6	.....	.44	12Z7	.....	.64	43	.....	.43
1L5	.95	6A8	.....	.65	6C8	.....	.39	6L7GT	.....	.49	12K7	.....	.70	12L7	.....	.64	43	.....	.43
1R5GT	.61	6A8A42	6C839	6L7GT49	12K770	12L764	4343
1P5GT	.58	6A865	6C839	6L7GT49	12K770	12L764	4343
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ciation makes available to its members many types of insurance protection at unusually low rates because of the aggregate amount of the premium payments made by participating members. Because of the facilities made possible by the financial cooperation of many thousands of members located in all sections of the country, NARDA was able to perfect a standard accounting system for appliance and radio-TV dealers specifically designed for their type of business. Also, through the co-operation of their members, they conduct an annual "cost of doing business" survey that provides their members with invaluable information for appraising the efficiency of their businesses in relation to the national averages.

Service Associations

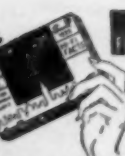
It has been interesting to observe the fast-growing interest among established service operators in all sections of the country in cooperative efforts through associations. Those that are fortunate enough to be headed up by officers who give freely of their time to plan organization programs and carry them out, have shown unusual progress in their activities.

In Indianapolis, Indiana, for instance, the Indianapolis Television Technicians Association has made remarkable progress in making the area a healthier place to do business for full-time, ethically-operated, independent television service businesses. The ITTA works closely with the Better Business Bureau. They are constantly alert to take advantage of every good promotional opportunity to focus public attention on ITTA members and what their double guarantee means in the way of competent service at fair charges. When the "Dragnet" TV program on TV servicing was telecast earlier this year, ITTA tied in with a spot to call set owners' attention to the association and why its members could be relied upon to give honest, reliable, and efficient television service.

One of the current programs of the association is designed to curb the activities of the low-service-charge advertisers who make up the difference by overcharging for the tubes they replace. The ITTA retained an advertising agency to design a striking mailing piece that includes the average list prices of the most commonly used receiving type tubes. Thousands of these flyers will be distributed house-to-house and by mail. Set owners are urged to keep the tube price charts and to check the tube charges made by any service technician or company that services the set. Fringe operators who get by on tube overcharges will head into a situation where practically any set owner may check their tube charges against one of these schedules.

Another association that is doing a terrific job on service promotion for their members and building set owner good-will is TISA of St. Louis. They are issuing technician identification and classification cards to qualified

See Radio



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shop owners and technicians in their area and urging set owners to ask to see the qualification card of any technician they call to service a set.

Dozens of other service associations in various parts of the country are using equally good promotions to help set owners identify ethically operated, competent service shops and technicians.

These cooperative programs are accomplishing excellent results in their areas, but they would be much more effective if they were supported by a national program that would enable the set owner to identify the dependable, competent shops regardless of where he may live.

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0Z4	.54	6BQ7A	1.24	6BQ7	.49	7Z4	.49	14B8	.85
1A7GT	.69	6BQ7A	.90	6BQ7	.49	7Z4	.49	14F7	.67
1AX2	.69	6BQ7A	.90	6BQ7	.49	7Z4	.49	14F8	.95
1B3GT	.69	6BQ7A	.90	6BQ7	.49	7Z4	.49	14H7	.39
1D8GT	.77	6BQ7A	.90	6BQ7	.49	7Z4	.49	14N7	.69
1G6GT	.54	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
1H5GT	.43	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
1L4	.59	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
1LA6	.79	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
1LC5	.59	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
1LD5	.52	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
1LE3	.78	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
1LN5	.57	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
1PSGT	.56	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
1Q5GT	.57	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
1R5	.54	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
1S4	.58	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
1S5	.45	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
1T4	.55	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
1U4	.53	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
1U5	.48	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
1V	.49	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
1X2A	.69	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
2A6	.49	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
2A7	.64	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
2X2	.39	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
2X2A	1.85	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
3A4	.44	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
3A5	.90	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
3A6GT	.60	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
3AL5	.43	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
3AU6	.47	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
3B7	.39	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
3BC5	.55	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
3BN6	.75	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
3CB6	.55	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
3D6	.39	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
3LF4	.79	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69
3Q4	.55	6BQ7A	.90	6BQ7	.49	7Z4	.49	14Y4	.69

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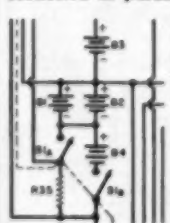
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ERRATA

Later production models of the new TV turret tuner, described in the article by Walter Buchsbaum on page 42 of the April 1955 issue, have incorporated some changes. The u.h.f. crystal is no longer mounted on the tuner chassis, under the trapdoor and, therefore, the clips are no longer on the chassis. The crystal is now mounted onto the u.h.f. strip directly. On the "T" series tuners, the crystal is connected to the number 1 terminal and the numbers 9 and 11 terminals are no longer used for this purpose.

We neglected to mention in the article that only the 21 mc. tuners use a 6J8 mixer-oscillator tube. One of the tubes used on the 41 mc. tuner is the 6AT8, which does not require neutralization at 41 mc. besides its other advantages as stated in the article. Standard Coil tuners using the 41 mc. i.f. band employ u.h.f. strips on which single conversion takes place directly from u.h.f. to i.f.

Two errors in the diagram of the scintillation counter (Fig. 2, page 38 of the April 1955 issue) have been brought to our attention. Capacitor C₁ should be connected in parallel with PL₁; in other words, the righthand terminal of C₁ should be connected to the top end of R₁ rather than the bottom end.



Also, the wiring of switch S_{1A} should be as indicated in the diagram (left) rather than as shown in the original schematic.

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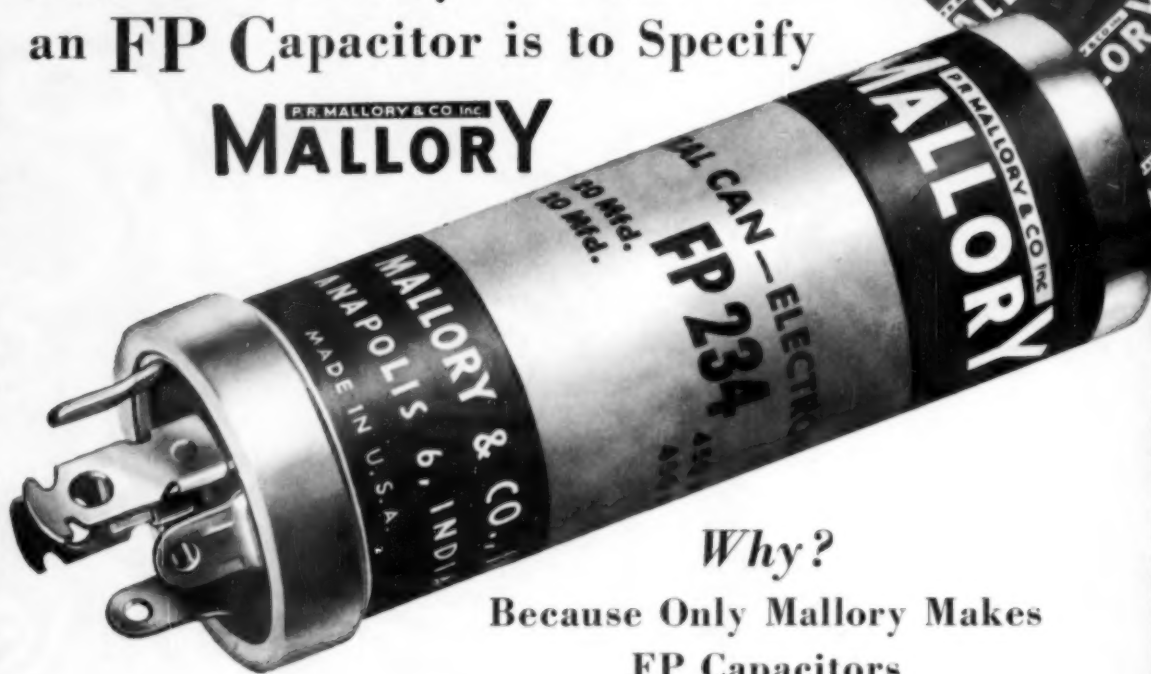
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